Brandon Gesicki | Partner & Compliance Director Canna Rios | 7 Years of Industry Experience

Brandon Gesicki is a trailblazer for the cannabis industry, spearheading local government

advocacy for several industry leading cannabis companies including Cookies Retail, Culture Club, EAZE and NUG among many others. He continues to collaborate with a variety of local counties and cities to establish regulatory ordinances for cannabis businesses. He and his firm, Capitol Consulting, possess deep experience in permitting for cannabis cultivation, distribution, manufacturing, retail operations and compliance management.

Mr. Gesicki besides being a leader in cannabis licensing, policy, and compliance he has direct experience in the industry through his partnership with Former Lt. Governor of California Abel Maldonado and his family. Brandon has managed all compliance and licensing operations for Canna Rios LLC, while the Maldonado's have successfully managed all the traditional farming related activities for their licensed cannabis business on their Santa Barbara County farm. Brandon has had the pleasure and honor of knowing the Maldonado family for more than 20 years and working with Abel Maldonado in some fashion for most of those years. Fall of 2021 Canna Rios Farms will release its first of soon to be many cannabis product brands.

Since 2014, Brandon has also been a dynamic presence in the emerging cannabis industry, and his input was pivotal on the path to legalization in the Monterey County area. In 2016, Brandon was chief consultant for Monterey County cannabis legalization efforts, managing both the Yes on Measure Y Cannabis Ordinance and Tax campaign (which passed with 75% of the vote) and the Yes on Measure J - King City Cannabis tax measure (which passed with 80% of the vote).). Brandon worked closely with local law enforcement, policy makers and various stake holders. Brandon's extensive knowledge of cultivation, processing, regulation, and research has kept him in high regard among industry leaders for advice and counsel.

Reflecting his broad policy experience and sound instincts, Brandon was also enlisted to assist policy makers in King City, Monterey County, and other parts of California in the development of cannabis business ordinances. Of particular note, is Brandon's extensive knowledge of licensing and regulations regarding cannabis cultivation, processing, retail, distribution, and manufacturing as well as expertise knowledge in industrial hemp farming regulations and licensing.

Prior to entering the cannabis space, Brandon spent over 20 years as a leading political strategist and trusted advisor on numerous congressional, state legislative, county and city campaigns. His astute counsel was highly regarded by many elected officials, notably serving as Chief of Staff and Senior Advisor to former California Lt. Governor Abel Maldonado. In his service with Senator Maldonado, Brandon become a policy expert in federal, state, and local agriculture, land use and environmental issues. He also has advised and worked with US House of Representatives Republican Leader Kevin O. McCarthy, former Ohio House Majority Whip Michael Dovilla and US House of Representatives Congressman Devin Nunes among many others. As the President and CEO of Capitol Consulting and Public Relations since 2004, he has managed multi-million-dollar political campaigns, developed substantial legislative, political, and public relations experience and is well-rehearsed in project management, setting targets, advanced communication skills, budgeting, and research.

Brandon is also managing member in a cannabis processing, manufacturing, distribution, and delivery company that is licensed in King City, California. In the City of Marina, Brandon is a partner in a city approved dispensary soon to be operational by end of the year. In Santa Barbara County, Brandon is a partner and lead the application efforts for (Cookies Orcutt) one of only six cannabis dispensaries selected in Santa Barbara County. Brandon is an active member of the Monterey County Cannabis Industry Association, a member of the NCIA - National Cannabis Industry Association, and member of the AAPC – American Association of Political Consultants.

Bien Nacido Estate 2018 Chardonnay

Sample ID: 2106MSO0105.0233
Strain: n/a
Matrix: Ingestible
Type: Beverage
Sample Size: 1 units; Batch:

Produced:
Collected:
Received: 06/16/2021
Completed: 06/25/2021
Batch#:

Client
Canna Rios
Lic. # 40-201069G
4651 Santa Maria Mesa Road
Santa Maria, CA 93454

Summary

Test	Date Tested	Result
Batch		Complete
Cannabinoids	06/25/2021	Complete
Moisture	06/25/2021	NR - Complete
Terpenes	06/17/2021	Complete

Cannabinoids

Complete

ND	ND	<LOQ
Total THC	Total CBD	Total Cannabinoids

Analyte	LOD	LOQ	Result	Result	Result
	mg/g	mg/g	mg/g	%	mg/mL
THCa	0.28	0.85	ND	ND	ND
Δ9-THC	0.14	0.50	ND	ND	ND
Δ8-THC	0.13	0.50	ND	ND	ND
CBDa	0.22	0.68	ND	ND	ND
CBD	0.13	0.50	ND	ND	ND
CBDV	0.28	0.84	ND	ND	ND
CBN	0.14	0.50	ND	ND	ND
CBGa	0.28	0.84	ND	ND	ND
CBG	0.19	0.58	ND	ND	ND
CBC	0.13	0.50	ND	ND	ND
Total THC			**<LOQ**	**<LOQ**	**<LOQ**
Total CBD			**<LOQ**	**<LOQ**	**<LOQ**
Total			**0.00**	**0**	

Date Tested: 06/25/2021
1 mL = 750g.
HPLC SOP-005. Visual screening of foreign material is supported by an Echo Rebel microscope, SOP-002. Water Activity is determined by a TDL WA meter, SOP-003. Moisture content is measured with a MT moisture analyzer, SOP-004.

Kaleb Asfaha
Chief Executive Officer
06/25/2021

Bien Nacido Estate 2018 Chardonnay

Sample ID: 2106MSO0105.0233
Strain: n/a
Matrix: Ingestible
Type: Beverage
Sample Size: 1 units; Batch:

Produced:
Collected:
Received: 06/16/2021
Completed: 06/25/2021
Batch#:

Client
Canna Rios
Lic. # 40-201069G
4651 Santa Maria Mesa Road
Santa Maria, CA 93454

Terpenes

Analyte	LOD	LOQ	Mass	Mass
	%	%	%	mg/g
3-Carene		0.20	ND	ND
α-Humulene		0.20	ND	ND
α-Pinene		0.20	ND	ND
α-Terpinene		0.20	ND	ND
β-Caryophyllene		0.30	ND	ND
β-Myrcene		0.20	ND	ND
β-Pinene		0.20	ND	ND
Camphene		0.30	ND	ND
δ-Limonene		0.20	ND	ND
Geraniol		0.50	ND	ND
Isopulegol		0.30	ND	ND
Linalool		0.20	ND	ND
p-Cymene		0.20	ND	ND
Terpinolene		0.20	ND	ND
trans-Ocimene		0.14	ND	ND
Total			**0.00**	**0**

Primary Aromas

Date Tested: 06/17/2021
GC-FID

Kaleb Asfaha
Chief Executive Officer
06/25/2021

Merso Labs
1204 W Laurel Ave
Lompoc, CA 93436

(805) 516-0627
http://www.mersolabs.com
Lic# C8-0000039-LIC

Informational Use Only - Not For Regulatory Use

Bien Nacido Estate 2018 Pinot Noir

Sample ID: 2106MSO0105.0235
Strain: n/a
Matrix: Ingestible
Type: Beverage
Sample Size: 1 units; Batch:

Produced:
Collected:
Received: 06/16/2021
Completed: 06/25/2021
Batch#:

Client
Canna Rios
Lic. # 40-201069G
4651 Santa Maria Mesa Road
Santa Maria, CA 93454

Summary

Test	Date Tested	Result
Batch		Complete
Cannabinoids	06/25/2021	Complete
Moisture	06/25/2021	NR - Complete
Terpenes	06/17/2021	Complete

Cannabinoids

Complete

ND	ND	<LOQ
Total THC	Total CBD	Total Cannabinoids

Analyte	LOD	LOQ	Result	Result	Result
	mg/g	mg/g	mg/g	%	mg/mL
THCa	0.28	0.85	ND	ND	ND
Δ9-THC	0.14	0.50	ND	ND	ND
Δ8-THC	0.13	0.50	ND	ND	ND
CBDa	0.22	0.68	ND	ND	ND
CBD	0.13	0.50	ND	ND	ND
CBDV	0.28	0.84	ND	ND	ND
CBN	0.14	0.50	ND	ND	ND
CBGa	0.28	0.84	ND	ND	ND
CBG	0.19	0.58	ND	ND	ND
CBC	0.13	0.50	ND	ND	ND
Total THC			**<LOQ**	**<LOQ**	**<LOQ**
Total CBD			**<LOQ**	**<LOQ**	**<LOQ**
Total			**0.00**	**0**	

Date Tested: 06/25/2021
1 mL = 750g.
HPLC SOP-005. Visual screening of foreign material is supported by an Echo Rebel microscope, SOP-002. Water Activity is determined by a TDL WA meter, SOP-003. Moisture content is measured with a MT moisture analyzer, SOP-004.

Kaleb Asfaha
Chief Executive Officer
06/25/2021

Merso Labs
1204 W Laurel Ave
Lompoc, CA 93436

(805) 516-0627
http://www.mersolabs.com
Lic# C8-0000039-LIC

Bien Nacido Estate 2018 Pinot Noir

Sample ID: 2106MSO0105.0235
Strain: n/a
Matrix: Ingestible
Type: Beverage
Sample Size: 1 units; Batch:

Produced:
Collected:
Received: 06/16/2021
Completed: 06/25/2021
Batch#:

Client
Canna Rios
Lic. # 40-201069G
4651 Santa Maria Mesa Road
Santa Maria, CA 93454

Terpenes

Analyte	LOD	LOQ	Mass	Mass
	%	%	%	mg/g
3-Carene		0.20	ND	ND
α-Humulene		0.20	ND	ND
α-Pinene		0.20	ND	ND
α-Terpinene		0.20	ND	ND
β-Caryophyllene		0.30	ND	ND
β-Myrcene		0.20	ND	ND
β-Pinene		0.20	ND	ND
Camphene		0.30	ND	ND
δ-Limonene		0.20	ND	ND
Geraniol		0.50	ND	ND
Isopulegol		0.30	ND	ND
Linalool		0.20	ND	ND
p-Cymene		0.20	ND	ND
Terpinolene		0.20	ND	ND
trans-Ocimene		0.14	ND	ND
Total			**0.00**	**0**

Primary Aromas

Date Tested: 06/17/2021
GC-FID

Kaleb Asfaha
Chief Executive Officer
06/25/2021

This product has been tested by Merso Labs, Inc. using valid testing methodologies and a quality system as required by state law. Environmental conditions are not taken unless the situation is such that the test results will be affected. All LQC samples were performed and met the prescribed acceptance criteria in 16 CCR section 5730, pursuant to 16 CCR section 5726(e)(13). Values reported relate only to the product tested. Merso Labs makes no claims as to the efficacy, safety or other risks associated with any detected or non-detected levels of any compounds reported herein. This Certificate shall not be reproduced except in full, without the written approval of Merso Labs.

Merso Labs
1204 W Laurel Ave
Lompoc, CA 93436

(805) 516-0627
http://www.mersolabs.com
Lic# C8-0000039-LIC

Informational Use Only - Not For Regulatory Use

Bien Nacido Estate 2018 Syrah

Sample ID: 2106MSO0105.0234
Strain: n/a
Matrix: Ingestible
Type: Beverage
Sample Size: 1 units; Batch:

Produced:
Collected:
Received: 06/16/2021
Completed: 06/25/2021
Batch#:

Client
Canna Rios
Lic. # 40-201069G
4651 Santa Maria Mesa Road
Santa Maria, CA 93454

Summary

Test	Date Tested	Result
Batch		Complete
Cannabinoids	06/25/2021	Complete
Moisture	06/25/2021	NR - Complete
Terpenes	06/17/2021	Complete

Cannabinoids

Complete

ND	ND	<LOQ
Total THC	Total CBD	Total Cannabinoids

Analyte	LOD	LOQ	Result	Result	Result
	mg/g	mg/g	mg/g	%	mg/mL
THCa	0.28	0.85	ND	ND	ND
Δ9-THC	0.14	0.50	ND	ND	ND
Δ8-THC	0.13	0.50	ND	ND	ND
CBDa	0.22	0.68	ND	ND	ND
CBD	0.13	0.50	ND	ND	ND
CBDV	0.28	0.84	ND	ND	ND
CBN	0.14	0.50	ND	ND	ND
CBGa	0.28	0.84	ND	ND	ND
CBG	0.19	0.58	ND	ND	ND
CBC	0.13	0.50	ND	ND	ND
Total THC			**<LOQ**	**<LOQ**	**<LOQ**
Total CBD			**<LOQ**	**<LOQ**	**<LOQ**
Total			**0.00**	**0**	

Date Tested: 06/25/2021
1 mL = 750g.
HPLC SOP-005. Visual screening of foreign material is supported by an Echo Rebel microscope, SOP-002. Water Activity is determined by a TDL WA meter, SOP-003. Moisture content is measured with a MT moisture analyzer, SOP-004.

Kaleb Asfaha
Chief Executive Officer
06/25/2021

Merso Labs
1204 W Laurel Ave
Lompoc, CA 93436

(805) 516-0627
http://www.mersolabs.com
Lic# C8-0000039-LIC

Informational Use Only - Not For Regulatory Use

Bien Nacido Estate 2018 Syrah

Sample ID: 2106MSO0105.0234
Strain: n/a
Matrix: Ingestible
Type: Beverage
Sample Size: 1 units; Batch:

Produced:
Collected:
Received: 06/16/2021
Completed: 06/25/2021
Batch#:

Client
Canna Rios
Lic. # 40-201069G
4651 Santa Maria Mesa Road
Santa Maria, CA 93454

Terpenes

Analyte	LOD	LOQ	Mass	Mass
	%	%	%	mg/g
3-Carene		0.20	ND	ND
α-Humulene		0.20	ND	ND
α-Pinene		0.20	ND	ND
α-Terpinene		0.20	ND	ND
β-Caryophyllene		0.30	ND	ND
β-Myrcene		0.20	ND	ND
β-Pinene		0.20	ND	ND
Camphene		0.30	ND	ND
δ-Limonene		0.20	ND	ND
Geraniol		0.50	ND	ND
Isopulegol		0.30	ND	ND
Linalool		0.20	ND	ND
p-Cymene		0.20	ND	ND
Terpinolene		0.20	ND	ND
trans-Ocimene		0.14	ND	ND
Total			**0.00**	**0**

Primary Aromas

Date Tested: 06/17/2021
GC-FID

Kaleb Asfaha
Chief Executive Officer
06/25/2021

This product has been tested by Merso Labs, Inc. using valid testing methodologies and a quality system as required by state law. Environmental conditions are not taken unless the situation is such that the test results will be affected. All LQC samples were performed and met the prescribed acceptance criteria in 16 CCR section 5730, pursuant to 16 CCR section 5726(e)(13). Values reported relate only to the product tested. Merso Labs makes no claims as to the efficacy, safety or other risks associated with any detected or non-detected levels of any compounds reported herein. This Certificate shall not be reproduced except in full, without the written approval of Merso Labs.

Merso Labs
1204 W Laurel Ave
Lompoc, CA 93436

(805) 516-0627
http://www.mersolabs.com
Lic# C8-0000039-LIC

Informational Use Only - Not For Regulatory Use

Runway 2018 Chardonnay

Sample ID: 2106MSO0105.0230
Strain: n/a
Matrix: Ingestible
Type: Beverage
Sample Size: 1 units; Batch:

Produced:
Collected:
Received: 06/16/2021
Completed: 06/25/2021
Batch#:

Client
Canna Rios
Lic. # 40-201069G
4651 Santa Maria Mesa Road
Santa Maria, CA 93454

Summary

Test	Date Tested	Result
Batch		Complete
Cannabinoids	06/25/2021	Complete
Moisture	06/25/2021	NR - Complete
Terpenes	06/17/2021	Complete

Cannabinoids

Complete

ND	ND	<LOQ
Total THC	Total CBD	Total Cannabinoids

Analyte	LOD	LOQ	Result	Result	Result
	mg/g	mg/g	mg/g	%	mg/mL
THCa	0.28	0.85	ND	ND	ND
Δ9-THC	0.14	0.50	ND	ND	ND
Δ8-THC	0.13	0.50	ND	ND	ND
CBDa	0.22	0.68	ND	ND	ND
CBD	0.13	0.50	ND	ND	ND
CBDV	0.28	0.84	ND	ND	ND
CBN	0.14	0.50	ND	ND	ND
CBGa	0.28	0.84	ND	ND	ND
CBG	0.19	0.58	ND	ND	ND
CBC	0.13	0.50	ND	ND	ND
Total THC			**<LOQ**	**<LOQ**	**<LOQ**
Total CBD			**<LOQ**	**<LOQ**	**<LOQ**
Total			**0.00**	**0**	

Date Tested: 06/25/2021
1 mL = 750g.
HPLC SOP-005. Visual screening of foreign material is supported by an Echo Rebel microscope, SOP-002. Water Activity is determined by a TDL WA meter, SOP-003. Moisture content is measured with a MT moisture analyzer, SOP-004.

Kaleb Asfaha
Chief Executive Officer
06/25/2021

Runway 2018 Chardonnay

Sample ID: 2106MSO0105.0230
Strain: n/a
Matrix: Ingestible
Type: Beverage
Sample Size: 1 units; Batch:

Produced:
Collected:
Received: 06/16/2021
Completed: 06/25/2021
Batch#:

Client
Canna Rios
Lic. # 40-201069G
4651 Santa Maria Mesa Road
Santa Maria, CA 93454

Terpenes

Analyte	LOD	LOQ	Mass	Mass
	%	%	%	mg/g
3-Carene		0.20	ND	ND
α-Humulene		0.20	ND	ND
α-Pinene		0.20	ND	ND
α-Terpinene		0.20	ND	ND
β-Caryophyllene		0.30	ND	ND
β-Myrcene		0.20	ND	ND
β-Pinene		0.20	ND	ND
Camphene		0.30	ND	ND
δ-Limonene		0.20	ND	ND
Geraniol		0.50	ND	ND
Isopulegol		0.30	ND	ND
Linalool		0.20	ND	ND
p-Cymene		0.20	ND	ND
Terpinolene		0.20	ND	ND
trans-Ocimene		0.14	ND	ND
Total			**0.00**	**0**

Primary Aromas

Date Tested: 06/17/2021
GC-FID

Kaleb Asfaha
Chief Executive Officer
06/25/2021

MERSO LABS

Merso Labs
1204 W Laurel Ave
Lompoc, CA 93436

(805) 516-0627
http://www.mersolabs.com
Lic# C8-0000039-LIC

Informational Use Only - Not For Regulatory Use

Runway 2018 Pinot Noir

Sample ID: 2106MSO0105.0231
Strain: n/a
Matrix: Ingestible
Type: Beverage
Sample Size: 1 units; Batch:

Produced:
Collected:
Received: 06/16/2021
Completed: 06/25/2021
Batch#:

Client
Canna Rios
Lic. # 40-201069G
4651 Santa Maria Mesa Road
Santa Maria, CA 93454

Summary

Test	Date Tested	Result
Batch		Complete
Cannabinoids	06/25/2021	Complete
Moisture	06/25/2021	NR - Complete
Terpenes	06/17/2021	Complete

Cannabinoids

Complete

ND	ND	<LOQ
Total THC	Total CBD	Total Cannabinoids

Analyte	LOD	LOQ	Result	Result	Result
	mg/g	mg/g	mg/g	%	mg/mL
THCa	0.28	0.85	ND	ND	ND
Δ9-THC	0.14	0.50	ND	ND	ND
Δ8-THC	0.13	0.50	ND	ND	ND
CBDa	0.22	0.68	ND	ND	ND
CBD	0.13	0.50	ND	ND	ND
CBDV	0.28	0.84	ND	ND	ND
CBN	0.14	0.50	ND	ND	ND
CBGa	0.28	0.84	ND	ND	ND
CBG	0.19	0.58	ND	ND	ND
CBC	0.13	0.50	ND	ND	ND
Total THC			<LOQ	<LOQ	<LOQ
Total CBD			<LOQ	<LOQ	<LOQ
Total			0.00	0	

Date Tested: 06/25/2021
1 mL = 750g.
HPLC SOP-005. Visual screening of foreign material is supported by an Echo Rebel microscope, SOP-002. Water Activity is determined by a TDL WA meter, SOP-003. Moisture content is measured with a MT moisture analyzer, SOP-004.

Kaleb Asfaha
Chief Executive Officer
06/25/2021

Runway 2018 Pinot Noir

Sample ID: 2106MSO0105.0231
Strain: n/a
Matrix: Ingestible
Type: Beverage
Sample Size: 1 units; Batch:

Produced:
Collected:
Received: 06/16/2021
Completed: 06/25/2021
Batch#:

Client
Canna Rios
Lic. # 40-201069G
4651 Santa Maria Mesa Road
Santa Maria, CA 93454

Terpenes

Analyte	LOD	LOQ	Mass	Mass
	%	%	%	mg/g
3-Carene		0.20	ND	ND
α-Humulene		0.20	ND	ND
α-Pinene		0.20	ND	ND
α-Terpinene		0.20	ND	ND
β-Caryophyllene		0.30	ND	ND
β-Myrcene		0.20	ND	ND
β-Pinene		0.20	ND	ND
Camphene		0.30	ND	ND
δ-Limonene		0.20	ND	ND
Geraniol		0.50	ND	ND
Isopulegol		0.30	ND	ND
Linalool		0.20	ND	ND
p-Cymene		0.20	ND	ND
Terpinolene		0.20	ND	ND
trans-Ocimene		0.14	ND	ND
Total			**0.00**	**0**

Primary Aromas

Date Tested: 06/17/2021
GC-FID

Kaleb Asfaha
Chief Executive Officer
06/25/2021

Bien Nacido & Solomon Hills

- Estate Wines -

2018 ESTATE CHARDONNAY

VARIETAL	CHARDONNAY - SELECTION 4
VINE AGE	PLANTED IN 1973
YIELD	2.2 TONS PER ACRE
CASES	923
ALCOHOL	12.6%

VINEYARD SITE

ESTATE	BIEN NACIDO VINEYARD
APPELLATION	SANTA MARIA VALLEY
COUNTY	SANTA BARBARA
VYD AREA	600-900 FT. ELEVATION. 16 MILES FROM THE PACIFIC OCEAN.

WINEMAKER NOTES

Hand harvested at night and whole cluster pressed. It was then barrel fermented with native yeast and malolactic fermentations. Aging was sur lie for 16 months in French oak; 20% new. This wine was bottled unfined and unfiltered.

Hailing from the historic W Block in Bien Nacido in 1973 on their own roots, this must be the most floral vintage of these vines in many years. Honeysuckle, fresh apple blossoms and chamomile blend into a more demure lemon oil and citrus peel palate. We think this wine will hit its peak in about 2028.

SOILS

Elder and Chamise shaly loams with Pleasanton sandy loam. The vineyard has a great diversity of soils containing limestone, shale, uplifted marine volcanics and loam.

ACCOLADES

One of the Year's Best CA Chardonnays - *Wine & Spirits*

93 Points - *Tasting Panel Magazine*

92 Points - *Jeb Dunnuck*

91 Points - *Vinous*

91 Points - *Wine & Spirits*

"Bien Nacido & Solomon Hills have been considered Grand Crus of the California. Of course, those closest to the land, the owners, have the choicest selection of fruit and awareness to showcase the best of that fruit under their estate label."

INFO@BIENNACIDOESTATE.COM

BIEN NACIDO & SOLOMON HILLS

- ESTATE WINES -

2018 ESTATE PINOT NOIR

CLONE	POMMARD, MT. EDEN, SWAN, CALERA, 114, 115, 667, 777 & 828
VINE AGE	PLANTED IN 1973, 1996, 2006
YIELD	2.4 TONS PER ACRE
CASES	570
ALCOHOL	13.0%

VINEYARD SITE

ESTATE	BIEN NACIDO VINEYARD
APPELLATION	SANTA MARIA VALLEY
COUNTY	SANTA BARBARA COUNTY
VYD AREA	600-900 FT. ELEVATION, 16 MILES FROM THE PACIFIC OCEAN.

WINEMAKER NOTES

Hand harvested at night and fermented with native yeast and malolactic fermentations. Aged 16 months in French oak; 30% new. This wine was bottled unfined and unfiltered.

Classic Bien Nacido Pinot Noir aromas of cardamom, clove buds, dried brush and black cherry mingle with young wine characters like bubblegum and red licorice. Concentrated on the palate with suave tannins, balanced acidity and a clean long finish. Open this immediately and know the sweetness of the fruit will stay around for decades.

SOILS

Elder, and Chamise shaly loams with Pleasanton sandy loam. The vineyard has a great diversity of soil containing loam, shales, uplifted marine volcanics, and limestone.

ACCOLADES

98 Points - *Tasting Panel Magazine*

95 Points - *Jeb Dunnuck*

"Bien Nacido & Solomon Hills have been considered Grand Crus of the California. Of course, those closest to the land, the owners, have the choicest selection of fruit and awareness to showcase the best of that fruit under their estate label."

INFO@BIENNACIDOESTATE.COM

BIEN NACIDO & SOLOMON HILLS

- ESTATE WINES -

2018 ESTATE SYRAH

CLONE	ESTRELLA
COMPOSITION	99% SYRAH 1% VIOGNIER
VINE AGE	PLANTED IN 1995
YIELD	1.7 TONS PER ACRE
CASES	659
ALCOHOL	13.1%

VINEYARD SITE

ESTATE	BIEN NACIDO VINEYARD
APPELLATION	SANTA MARIA VALLEY
COUNTY	SANTA BARBARA COUNTY
VYD AREA	700 FT. ELEVATION. VINES FACE DIRECTLY WEST 16 MILES FROM THE PACIFIC OCEAN.

WINEMAKER NOTES

Hand harvested at night, and fermented with native yeast and malolactic fermentations. Aged 16 months in French oak; 25% new. This wine was bottled unfined and unfiltered.

"Pink peppercorns and violet flowers sprinkled over summer rain moistened soils." It is almost poetic what this wine can say. A true Midsummer Night's Dream, the liveliness of the fruit is faultless. Crunchy blueberry, lingonberry and spicy black currants. You can expect olive brine and roasted meats to evolve with 5-8 years in bottle, but the youth and vigor of this Syrah will stick around for a while.

SOILS

Los Osos clay loam and Franciscan shale over marine volcanics

ACCOLADES

95 Points - *Tasting Panel Magazine*

94 Points - *Vinous*

92+ Points - *Jeb Dunnuck*

"Bien Nacido & Solomon Hills have been considered Grand Crus of the California. Of course, those closest to the land, the owners, have the choicest selection of fruit and awareness to showcase the best of that fruit under their estate label."

INFO@BIENNACIDOESTATE.COM

Civil Law and Motion Calendar
May 25, 2021
10:00 a.m.

Santa Barbara Coalition for Responsible Cannabis, Inc.
v.
County of Santa Barbara, et al.
#20CV01736

Attorneys

For Petitioner Santa Barbara Coalition for Responsible Cannabis, Inc.: Marc Chytilo, Ana Citrin, Law Office of Marc Chytilo, APC; Courtney E. Taylor; Robert A. Curtis, Foley Bezek Behle & Curtis, LLP

For Respondents County of Santa Barbara and Santa Barbara County Board of Supervisors: Michael C. Ghizzoni, Lina Somait, Office of Santa Barbara County Counsel

For Real Parties in Interest Busy Bee's Organics and Sara Rotman: Amy M. Steinfeld, Beth A. Collins, Brooke M. Wangsgard, Brownstein Hyatt Farber Schreck, LLP

Emails: marc@lomcsb.com; ana@lomcsb.com; me@courtneyetaylor.com; rcurtis@foleybezek.com; lsomait@co.santa-barbara.ca.us; asteinfeld@bhfs.com; bcollins@bhfs.com; csargeant@bhfs.com

Issue

Petition For Writ of Mandate; Petitioner contends that County's approval of the Busy Bee's Project constituted a prejudicial abuse of discretion and must be set aside.

Ruling on the Petition For Writ of Mandate

The Petition For A Writ of Mandate is DENIED.

Rulings on request for Judicial Notice

County requests:

1. Chapter 50, Licensing of Cannabis Operations, of the Santa Barbara County Code.

2. The February 6, 2018, Findings for Approval and Statement of Overriding Consideration for the County's Cannabis Land Use Ordinances.

Busy Bee requests:

1. County of Santa Barbara Board of Supervisors Agenda Letter for February 6, 2018.

2. County of Santa Barbara Board of Supervisors Agenda Letter for April 10, 2018.

Judicial notice is the recognition and acceptance by the court, for use by the trier of fact or by the court, of the existence of a matter of law or fact that is relevant to an issue in the action without requiring formal proof of the matter. Judicial notice may not be taken of any matter unless authorized or required by law. Matters that are subject to judicial notice are listed in Evid. Code §§ 451 and 452. A matter ordinarily is subject to judicial notice only if the matter is reasonably beyond dispute. Taking judicial notice of a document is not the same as accepting the truth of its contents or accepting a particular interpretation of its meaning. While courts take judicial notice of public records, they do not take notice of the truth of matters stated therein. When judicial notice is taken of a document, the truthfulness and proper interpretation of the document are disputable. *Herrera v. Deutsche Bank National Trust Co.*, (2011) 196 Cal. App. 4th 1366.)

Ruling on requests for judicial notice: GRANTED as to all the requests.

Acknowledgements

The Court acknowledges and appreciates the professional work done by counsel in the case.[1] The Court found the briefing to be very high quality; useful; informative; thoughtful; prompt. Reasonable people can differ.

Background

[1] The Court apologizes for any grammatical and typographical errors in this decision.

In law, as in so many other instances, the devil is in the details; in CEQA, the devil is in the process.

On February 6, 2018, County adopted a Cannabis Ordinance regulating commercial cannabis land uses for the inland areas of Santa Barbara County. A Program Environmental Impact Report (PEIR) for the Cannabis Ordinance was prepared in 2017 and certified on February 6, 2018. When the PEIR was certified, the Uniform Rules for Agricultural Preserves and Farmland Security Zones (Uniform Rules) of County did not allow cannabis activities on parcels subject to an Agricultural Preserve contract. The County's Agricultural Preserve Advisory Committee (APAC) is responsible for administering the County's Agricultural Preserve Program and the Uniform Rules. On March 20, 2018, the Board amended the County's Uniform Rules to allow cannabis activities on Williamson Act contracted lands and to define cannabis cultivation as an agricultural use on lands subject to Agricultural Preserve contracts.

Real party in interest Busy Bee [RPI] is the applicant for the Busy Bee's Organics cannabis cultivation project (the Project) and the owner and operator of the ongoing cannabis operation on the Project site. Sara Rotman is Busy Bee's principal and is listed as a Project applicant. The Project site is a 62.45-acre agriculturally zoned parcel located on Highway 246, west of the City of Buellton. The property has historically been farmed with irrigated crops, has included grazing, and is subject to Williamson Act Agricultural Preserve contract 76-AP-019.

The property is bound by Highway 246 to the north, a 63-acre agricultural property to the west, the Santa Ynez River through three agricultural properties to the south (223 acres, 69 acres, and 62 acres in size) and an 88-acre agricultural property to the east. These surrounding agricultural properties are also under Agricultural Preserve contracts.

On November 21, 2018, RPI requested a County Land Use Permit (LUP) to allow 18 acres of outdoor cannabis cultivation. Prior to applying for a LUP to authorize commercial cannabis cultivation and related activities, RPI cultivated cannabis under the County's limited allowance for the continuation of legal nonconforming cannabis operations that existed as of January 19, 2016.

On January 11, 2019, APAC reviewed the proposed project and the Williamson Act contract for consistency with the Uniform Rules. APAC required that 22 acres of cannabis cultivation be proposed in order for the parcel to continue to be eligible for the Agricultural Preserve contract pursuant to the Williamson Act. APAC did not evaluate the proposed cultivation under the principles of compatibility.

On May 7, 2019, County's Planning and Development staff determined that all the environmental impacts of the RPI's cannabis operation would be within the scope of the PEIR. The same day, the Planning and Development Department Director approved RPI's cultivation LUP. This LUP was timely appealed to the Planning Commission by neighboring farmer Sharyne Merritt.

On May 8, 2019, RPI submitted an application for a new and separate LUP to place 22 acres of hoop structures over the approved cultivation area and add two 3,000 sq. ft. agricultural buildings for processing and one new 1,080 sq. ft. shade structure. The Planning and Development Department determined that the Planning Commission appeal would be a *de novo* hearing of the entirety of both proposed LUP's, so RPI withdrew its second LUP application and incorporated its elements into the project description of the LUP pending Planning Commission review.

The Planning Commission held two hearings to consider RPI's LUP on October 30, 2019, and November 7, 2019. After extensive public testimony and deliberation, the Planning Commission approved the Project with various conditions of approval to help achieve consistency with applicable policy requirements and reduce documented conflicts between agricultural land uses.

Petitioner Santa Barbara Coalition for Responsible Cannabis, Inc. (Petitioner) is a California public benefit corporation whose purposes include protecting the interests of neighborhoods, communities and others affected by the County's inadequate regulation of commercial cannabis activities, upholding the County's General Plan and Zoning Ordinances and enforcing CEQA and the Williamson Act when actions adversely affect other land users including residential uses and agriculture.

Petitioner (together with Merritt, who later stepped back as an appellant), and RPI, each timely appealed the Planning Commission's approval to the Board. Among other things, Petitioner raised and presented substantial evidence supporting arguments that Project approval would violate CEQA (Pub. Res. Code, § 21000 et seq.) and the Williamson Act, and challenging the adequacy of LUP approval findings required by the LUDC including the County's pattern and practice of ignoring violations based on illegal expansions of nonconforming cannabis operations, including RPI's own illegal expansion of cannabis cultivation.

On March 17, 2020, the Board heard the dual appeals of the Planning Commission's conditional approval. The Board revised the Project to strip away the conditions added by the Planning Commission and grant RPI's approval for 22 acres of cannabis cultivation, including 2,700 sq. ft. of mixed-light and nursery cultivation within an existing greenhouse and a maximum of five acres that will be under 12 ft. tall hoop structures.

On April 23, 2020, Coalition filed its petition for writ of mandamus asserting four causes of action: (1) violation of CEQA; (2) violations of state planning and zoning laws (Gov. Code, § 65000 et seq.); (3) violation of the Williamson Act; and (4) pattern and practice of violating CEQA, etc.

On May 28, 2020, the parties filed a stipulation to dismiss Laurel Fisher Perez as a real party in interest. On June 1, the Court entered dismissal of Perez with prejudice.

On June 19, 2020, County filed a notice of related case identifying Santa Barbara Coalition for Responsible Cannabis v. County of Santa Barbara, et al., case number 19CV02459, filed on May 9, 2019, and Santa Barbara Coalition for Responsible Cannabis v. County of Santa Barbara, et al., case number 20CV01907, filed on May 29, 2020, as related cases. On September 18, 2020, the Court denied relating these cases at this time.

On September 1, 2020, Petitioner filed a request for dismissal, and the Court entered dismissal as to the fourth cause of action without prejudice.

On October 2, 2020, the Court entered its order on the stipulation of the parties striking from the petition items C, D, and E from the prayer for relief of the Petition.

A Demurrer and a Motion to Strike were filed; the Demurrer was sustained in part on December 1, 2020.

On December 16, 2020, Petitioner filed its First Amended Petition for Writ of Mandamus; set out in three counts:

Count #1: Violations of CEQA: Pub. Res. Code §§ 21000, et seq.

Count #2: Violations of State Planning and Zoning Laws: Gov. Code § 65000, et seq.

Count #3: Violations of the California Land Conservation Act (Williamson Act) Cal. Govt. Code §§51200 et seq.

The Writ requests: (1) Alternative and Peremptory Writs of Mandate ordering County to vacate and set aside their approval of the Busy Bee's Organics Cannabis Cultivation Project Land Use Permit and CEQA determination for the Project; (2) An order staying the approval and prohibiting County and Real Party in Interest from engaging in any activity pursuant to the Busy Bee's Organics Cannabis Cultivation Project approvals until such time that County have complied with CEQA, the Williamson Act, and all other applicable state and local laws, policies, ordinances and regulations as are directed by this Court; (3) Reasonable attorneys' fees and costs.

On January 20, 2021, RPI filed an Answer; on February 8, 2021, County filed an Answer.

A Briefing Schedule was set: Petitioner to file its Opening Brief by March 12; County and RPI to each file their Opposition Briefs by April 12; Petitioner to file its Reply Brief(s), by May 10. Hearing set for May 25, 2021.

Standard of Review for Administrative Mandamus

CCP§ 1094.5 sets forth the standard of review for writ petitions attacking the validity of administrative decisions like Respondents' approval of the LUP at issue in this case. Under CCP § 1094.5 a court determines whether the respondent has proceeded without, or in excess of, jurisdiction; whether there was a fair trial; and whether there was any prejudicial abuse of discretion. CCP § 1094.5 (b). Abuse of discretion is established if the respondent has not proceeded in the manner required by law, the order or decision is not supported by the findings, or the findings are not supported by the evidence. Where it is claimed that the findings are not supported by the evidence, abuse of discretion is established if the findings are not supported by substantial evidence in the light of the whole record. Findings adopted by administrative agencies must also bridge the analytical gap between evidence and the ultimate decision. *Topanga v. County of L.A.* (1974) 11 Cal.3d 506, 510.

Petitioner's Contentions
[Summarized]

Petitioner contends that County's approval of the Project constituted a prejudicial abuse of discretion and must be set aside; that rather than evaluate

and mitigate significant agricultural and land use impacts, County decisionmakers swept them under the rug. The Board approved the Project without site-specific environmental review of impacts on other agricultural operations in the area, and without finding that the use is consistent with the Williamson Act's Principles of Compatibility. The Board disregarded the unauthorized expansion of Busy Bee's nonconforming operation and made legally unsupportable findings that the Project site is in compliance with the County ordinance and other applicable laws. The Board's approval of the Project violated CEQA, the Williamson Act, and Planning and Zoning Law.

Petitioner points out, in support of its contentions, that when County prepared and certified the PEIR for the County's ordinance amendment package allowing commercial cannabis cultivation and other cannabis activities throughout the unincorporated County, the environmental effects of allowing this new type of land use were not well understood; the PEIR anticipated that site-specific environmental review of agricultural conflicts and land use impacts would occur before individual cannabis operations received land use entitlements; grows such as Busy Bee's, operating under the County's limited allowance for nonconforming medical grows, began illegally expanding before obtaining permits to operate under the new Cannabis Ordinance; farmers and rural residents began encountering the myriad land use conflicts that arise when cannabis is grown adjacent to other non-cannabis land uses; the conflicts include disputes over normal cultivation activities, application of pesticides and fertilizers, the exposure of farmworkers and rural residents to noxious odors, and threatened litigation, which impair the continued viability of legacy agriculture in the Santa Ynez Valley and elsewhere in the County's rural areas.

When County approved the Project and other first generation cannabis permits at the staff level with no apparent site-specific environmental review, members of the public, including Petitioners, raised the alarm bell; series of appeal hearings followed; County heard accounts from residents, business owners, and agricultural experts that cultivating cannabis in close proximity to traditional crops like vegetables and wine grapes results in conflicts that undermine the viability of agricultural operations that have existed for decades; agricultural conflicts that occur on parcels subject to Agricultural Preserve contracts are particularly significant, as the Williamson Act which authorizes the County's Agricultural Preserve Program prohibits the approval of uses on contracted lands that "impair" agricultural operations on other contracted lands (among other "Principles of Compatibility"); the County's Agricultural Commissioner convened a working group to identify and evaluate potential mitigation measures.

Petitioner's Alleged Violations of CEQA

The Principles. The foremost principle under CEQA is that the Legislature intended the act to be interpreted in such manner as to afford the fullest possible protection to the environment within the reasonable scope of the statutory language. *Friends of Mammoth v. Board of Supervisors (1972) 8 Cal.3d 247, 259.*

A court reviews a public agency's CEQA compliance for prejudicial abuse of discretion, which is established where the agency fails to proceed in the manner required by CEQA or if the agency's CEQA determination is not supported by substantial evidence. *PRC § 21168.5*. Judicial review of whether the agency has employed the correct procedures is determined *de novo* and the court must scrupulously enforce all legislatively mandated CEQA requirements. *Vineyard Area Citizens v. City of Rancho Cordova (2007) 40 Cal.4th 412, 435*.

Judicial review of an agency's substantive factual conclusions extends to whether they are supported by substantial evidence in the record. Substantial evidence means enough relevant information and reasonable inferences from this information that a fair argument can be made to support a conclusion, even though other conclusions might also be reached. *Guidelines § 15384 (a).* Substantial evidence shall include facts, reasonable assumptions predicated upon facts, and expert opinion supported by facts. *[Guidelines § 15384 (b).* Substantial evidence is not argument, speculation, unsubstantiated opinion or narrative, evidence that is clearly inaccurate or erroneous, or evidence of social or economic impacts that do not contribute to, or are not caused by, physical impacts on the environment. *PRC § 21080 (e)(2); Guidelines § 15384 (a).* A reviewing court must adjust its scrutiny to the nature of the alleged defect, depending on whether the claim is predominantly one of improper procedure or a dispute over the facts. *Vineyard Area Citizens, 25 40 Cal.4th at 435.*

Where the inquiry presents a mixed question of law and fact, it is subject to independent review unless questions of fact predominate, in which case it is subject to substantial evidence review. *King & Gardiner Farms, LLC v. County of Kern (2020) 45 Cal.App.5th 814, 843.*

Whether the substantial evidence or fair argument standard of review applies to an agency's decision to forgo subsequent environmental review for a later activity based on a program EIR depends on the degree to which the program EIR conducted in-depth review. *See CREED v. City of San Diego Redevelopment Agency (2005) 134 Cal.App.4th 598, 611*.

Under Guidelines section 15168, program EIR's are used for a series of related actions that can be characterized as one large project. *Center for Sierra Nevada Conservation v. County of El Dorado (2012) 202 Cal. App. 4th 1156, 1171.* A program EIR does not always suffice for a later project. Sometimes a tiered EIR is required, sometimes a subsequent or supplemental EIR is required, and sometimes a supplement to an EIR is required. *NRDC. v. City of L.A. (2002) 103 Cal.App.4th 268, 282.* A program EIR will be most helpful in dealing with later activities if it provides a description of planned activities that would implement the program and deals with the effects of the program as specifically and comprehensively as possible.

With a good and detailed project description and analysis of the program, many later activities could be found to be within the scope of the project described in the program EIR, and no further environmental documents would be required. *Guidelines § 15168 (c)(4).* Designating an EIR as a program EIR does not by itself decrease the level of analysis required; it still must provide decision-makers with sufficient analysis to intelligently consider the environmental consequences of the project under consideration. *Cleveland National Forest Foundation v. SANDAG (2017) 17 Cal.App.5th 413, 426.* Accordingly, a program EIR may serve as the environmental review document for a later activity in the program, but only to the extent that it contemplates and adequately analyzes all potential environmental impacts of the later activity. *Center for Biological Diversity v. Dept. of Fish & Wildlife (2015) 234 Cal.App. 4th 214, 233.*

Before approving a later activity in the program, the lead agency must examine that activity in light of the Program EIR to determine whether an additional environmental document must be prepared. *Guidelines § 15168 (c).* Where the later activity involves site-specific operations, the agency should use a written checklist or similar device and document the evaluation of the site and activity to determine whether the environmental effects of the operation were within the scope of the program EIR. *Guidelines § 15168 (c)(4).* If a later activity would have effects that were not examined in the program EIR, a new Initial Study would need to be prepared leading to either an EIR or a Negative Declaration. That later analysis may tier from the program EIR. *Guidelines § 15168 (c)(1).* The agency can approve the activity as being within the scope of the project covered by the Program EIR, and no new environmental document would be required only if the agency finds that no subsequent EIR would be required under Guidelines § 15162. *Guidelines § 15168 (c)(2).* Pursuant to Guidelines § 15162, a subsequent EIR is required where substantial changes occur with respect to the circumstances under which the project is undertaken, which will require major revisions of the previous EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects. *Guidelines § 15162 (a)(1-2).*

A subsequent EIR is required if new information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at the time the previous EIR was certified, shows either that: a) the project will have one or more significant effects not discussed in the previous EIR; b) significant effects previously examined will be substantially more severe than shown in the previous EIR; c) mitigation measures or alternatives previously found not to be feasible would in fact be feasible, and would substantially reduce one or more significant effects of the project, but the project proponents decline to adopt the mitigation measure or alternative; or d) mitigation measures or alternatives which are considerably different from those analyzed in the previous EIR would substantially reduce one or more significant effects on the environment, but the project proponents decline to adopt the mitigation measure or alternative. *Guidelines § 15162 (a)(3); see PRC § 21166 (c).*

Petitioner's Arguments

Argument #1. The Cannabis PEIR did not contemplate or analyze the potential environmental impacts of the Project on nearby agricultural operations. The Cannabis PEIR included no site-specific review of individual cannabis projects and lacks a sufficiently specific and comprehensive analysis of agricultural land use conflicts. Additional environmental review of agricultural land use conflicts is necessary to adequately inform decisionmakers and the public of the Project's significant impacts and ensure that the impacts are reduced with enforceable mitigation. The Cannabis PEIR is a Program EIR which attempted to address the impacts of a countywide program with eligible land over hundreds of thousands of acres and potential effects on five major regions, eight cities, and 24 unincorporated communities.

The PEIR was completed in its entirety over a short 26-month period. The PEIR does not include a site-level analysis of individual cannabis permit applications, and expressly contemplates the preparation of subsequent CEQA review documents and further CEQA review to determine site-specific impacts. The PEIR's agricultural impact discussion references the Land Use section, which in turn refers to the Air Quality section, for additional analysis of land use conflicts. However, the analysis of land use and air quality impacts addresses how cannabis activities including cultivation may impact residential uses, not agricultural uses;

protects residentially-zoned neighborhoods and does not apply in the AG-II zones so does not even purport to address odors impacting sensitive receptors on agricultural parcels including homes, businesses, and agricultural workers in the field. No mitigation measure identified in the PEIR addresses land use conflicts between cannabis cultivation and other agricultural land uses.

Petitioner argues the only analysis in the PEIR that directly addresses conflicts between cannabis activities authorized under the Cannabis Ordinance and existing agriculture, including farms subject to Williamson Act contracts, relies on future case-by-case APAC review and project-specific site compatibility review to ensure land use compatibility with adjacent agricultural crops and avoid conflicts with Williamson Act conflicts was not codified as a mitigation measure. Because the PEIR did not include specific mitigation measures for agricultural conflicts and the manner in which the County's CEQA Checklist mirrored PEIR mitigation measures, this project's agricultural conflicts were not addressed at all in the CEQA Checklist, the County's only CEQA review of Busy Bee's site-specific impacts.

This impact was not analyzed or mitigated for the Project despite clear evidence of the impacts, some of which were already occurring. That CEQA case law regarding program EIRs and review of later activities emphasizes that the specificity of the program EIR's impact analysis of later activities in the program is important in determining whether subsequent environmental review is required. Here, the Cannabis PEIR does not provide decisionmakers (or the public) with sufficient analysis of agricultural land use conflicts to understand the environmental consequences of cannabis cultivation projects, including this Project on surrounding agricultural operations, Williamson Act contracts, or on the viability of traditional agriculture including viticulture within the Santa Ynez Valley. These conflicts, which include disputes over normal cultivation activities, application of plant protection materials, application of fertilizers, farmworker odor exposure and terpene drift require site specific review of surrounding land uses and local meteorological conditions which was not done in the PEIR.

Argument #2. The County failed to perform necessary site-specific environmental review of the Project's agricultural land use conflicts. The written checklist for site-specific activities like the Project serves to document the evaluation of the site and the activity to determine whether the environmental effects of the operation were covered within the scope of the program EIR. The CEQA Checklist prepared for the Project did not cover the topic of agricultural land use conflicts at all, omitting the site-specific review of agricultural land use conflicts the PEIR assumed would occur when the County evaluated later activities. The Initial CEQA Checklist does not demonstrate that County staff engaged in any substantive evaluation of the site or activity to determine whether the environmental effects of the Project were actually disclosed and analyzed in the PEIR. Petitioner acknowledges that there was a supplement but argues that the revised Checklist is silent as to agricultural resource and land use impacts arising from agricultural conflicts, even though the record demonstrated that the Project was and would continue having significant conflicts with adjacent conventional agriculture which would worsen when the Project expanded its cannabis cultivation to the rest of the site.

Argument #3. Changes in the County's administration of its Agricultural Preserve Program substantially increased significant impacts of cannabis cultivation on land uses in agricultural zoned parcels arising from Post-PEIR changes and new information. The County was required to prepare a subsequent EIR where, *inter alia,* major changes to the prior EIR are necessary due to substantial changes in the project, the circumstances under which the project is undertaken, or where new information that was previously unavailable led to new significant environmental effects or a substantial increase in the severity of previously identified significant effects.

As a result of these changes, the APAC review relied on by the PEIR to address agricultural conflicts arising on Williamson Act contract parcels like Busy Bee's was eliminated. APAC's review failed to evaluate whether the Project would conflict with adjacent agricultural operations on other Williamson Act contracted lands, many of which have been under Williamson Act contract for over fifty years, and in no way ensured compatibility as the PEIR anticipated. With cannabis classified as a qualifying use, APAC directed an 18% increase (from 18 to 22 acres) in cultivated cannabis acreage to satisfy the Project's minimum production requirements under their Williamson Act contract. The increase in cultivated cannabis acreage increased impacts; odor/terpene emissions; traffic; employees and facilities; brought cultivated cannabis into closer proximity with neighboring properties, substantially increasing land use conflicts including conflicts between agricultural land uses.

The County increased these conflicts by bringing cultivated cannabis into closer proximity with other forms of agriculture directly contrary to its assumed role in the PEIR. An actual conflict had already occurred between Busy Bee and one of its farming neighbors, in which the neighbor's pest control applicator was threatened by Busy Bee's lawyer for using materials essential to their agricultural production. Conflicts have arisen between cannabis cultivators and wine producers over the potential for cannabis grown near wine grapes to deposit terpenes on grape skins, tainting the quality and sale-ability of wine produced from those grapes.

These substantially increased agricultural conflicts are the result of changes in the Cannabis Ordinance program (as the Project reviewed by the PEIR) and the County's treatment of cannabis cultivation on Williamson Act parcels arising after the PEIR's certification, and new information that was unavailable when the PEIR was certified. Accordingly, pursuant to Guidelines § 15168 (c)(1-2), a new Initial Study should have been prepared, leading to an EIR that could be tiered from the program EIR but would specifically address the changed circumstances and new information, and include new and revised impact analysis and mitigation.

Argument #4. The County's CEQA findings are not supported by substantial evidence in the record and are legally inadequate. The County made the following CEQA finding:

"As shown in the written checklist and other information provided in the administrative record (e.g., Proposed Project plans and Land Use Permit application), the Proposed Project is within the scope of the PEIR and the effects of the Proposed Project were examined in the PEIR. Therefore, on the basis of the whole record, including the written checklist, the previously certified PEIR, and any public comments received, the Board of Supervisors finds that the Proposed Project will not create any new significant effects or a substantial increase in the severity of previously identified significant effects on the environment, and will not present new information of substantial importance pursuant to State CEQA Guidelines Section 15162, thereby warranting the preparation of a new environmental document for the Proposed Project."

Petitioner contends that the evidence in the administrative record shows that substantial evidence does not support this finding, and accordingly the County abused its discretion in approving the Project; that the County further abused its discretion by approving findings that do not bridge the analytic gap between the evidence and the conclusion that the Project will not create a substantial increase in the severity of previously identified significant effects on the environment. Contrary to the County's finding, the Checklist refers to no evidence that would support a conclusion that the Project's agricultural land use conflicts are addressed in the PEIR. The CEQA Checklist for the Project did not address agricultural land use conflicts and APAC did not conduct compatibility review as the PEIR anticipated. The Checklist is silent on the post-PEIR certification Uniform Rules changes which Petitioner repeatedly raised as a changed circumstance leading to substantially increased agricultural and land use impacts.

That the findings incorrectly state that APAC compatibility review occurred when the evidence shows the opposite. There is overwhelming evidence in the record showing that otherwise-lawful pesticide drift has caused actual conflicts between cannabis cultivation on the subject contracted parcel and other contracted lands in agricultural preserve including Agricultural Preserve Contract placing the issue squarely within APAC's purview. The Applicant's Odor Abatement Plan, prepared due to the Project's location within the Santa Ynez Valley Community Plan Area, is silent on exposure to agricultural receptors and rejects staggering of the odorous harvest operations in favor of a shorter, but more intensive period of emissions during the twice-annual harvest.[2]

The Court's Analysis of Petitioner's CEQA Arguments

The Court finds that the Petitioner cannot prevail on the CEQA claim based upon the facts and the law in this case. County and RPI have vastly too many arrows in their quiver, many of which are fatal.

Petitioner argues strenuously against the claims made by RIP about the extensive background of this case. But the Court finds RIP's argument relevant and persuasive. The County underwent an extensive cannabis regulatory process. The County first introduced regulations for medical cannabis which Petitioner did not oppose. The County in January 2016 adopted Ordinance No. 4954, adding a new Article X, titled "Medical Marijuana Regulations" to Section 35, Zoning, of the County Code of Ordinances. The Petitioner did not challenge Article X. The County then underwent an extensive process to regulate commercial cannabis cultivation, which Petitioner did not oppose. The County conducted a lengthy associated CEQA process in 2017 and 2018. On February 27, 2018, over two years after the County began creating the new cannabis regulations, the Board adopted the cannabis Ordinance and certified the PEIR. Petitioner did not challenge the PEIR or the Ordinance. The County also adopted a cannabis business license ordinance which Petitioner did not oppose. The County then amended its Uniform Rules and again Petitioner filed no litigation. RIP's argument that Petitioner's case is not about Busy Bee's Farm makes sense. As RIP argues it appears to be rooted

[2] The Court has not set out all the argument made. When the Court works on a Decision over many days, as it did here, the Court sets out just enough to be able to capture the essence of complaints made. The Court is confident it understands the arguments made.

in regret because Petitioner did not challenge the County's PEIR and Cannabis Ordinance when they were adopted in February 2018.

The Court finds that despite Petitioner's vigorous claim to the contrary in its Reply Brief, Petitioner failed to set forth all the evidence favorable to the County's decision and show where it is lacking is fatal to its challenge.

Petitioner bears the burden of demonstrating that the record does not contain sufficient evidence justifying a contested project approval. An appellant must set forth in its brief all the material evidence on the point, not merely its own evidence. A failure to do so is deemed a concession that the evidence supports the findings. The Court defers to the lead agency's findings in CEQA cases involving the substantial evidence standard of review. (*Latinos Unidos de Napa vs City of Napa* (2013) 221 Cal.App.4th 192, 206.)[3] Here there was substantial evidence to support the County's decision that the Project is within the scope of the PEIR. None of it was cited or discussed in Petitioner's opening brief. For this reason alone, the Writ should be denied.

The PEIR analyzed the potential environmental impacts of the Program on agricultural resources. Petitioner argues that the Cannabis PEIR did not contemplate or analyze the potential environmental impacts of the Project on nearby agricultural operations. *This is not so. Petitioner simply disagrees with the conclusion in the PEIR that there are no conflicts*. Important to the Court's analysis is the fact that both terpene taint of grapes and pesticide migration from neighboring agriculture onto cannabis crops were considered in the PEIR. The PEIR contemplated land use conflicts; compatibility issues with businesses; including wineries, near outdoor and indoor cultivation sites due to odors. The PEIR describes the Program impacts to Agricultural Resources; proposed land uses under the proposed Project are potentially incompatible with existing zoning for agricultural uses and Williamson Act contracts. The PEIR explains that growing cannabis is a land use for agricultural purposes and cannabis products are agricultural products; utilizing a license to grow cannabis would ensure agricultural purposes are carried out; these actions would not convert associated FMMP farmland or prime agricultural soils to non-agricultural uses, nor conflict with existing zoning for agricultural uses. It also explains that cannabis cultivation is within the definitions of "agricultural commodity" and "agricultural use" under the Williamson Act, and that the Department of Conservation has stated that

---

[3] The Court has not ignored Petitioner's objection to the relevance of this case.

nothing in the Williamson Act prohibits the growth of cannabis on land enrolled in the Williamson Act.

The “agricultural land use conflicts” argued by Petitioner are not environmental impacts under CEQA. Social and economic effects are not to be considered a significant environment effect and need be considered only to the extent that they are relevant to an anticipated physical change in the environment or, on the basis of substantial evidence, are reasonably likely to result in physical change to the environment. Petitioner does not argue in its brief that the Project has caused or will cause conversion of agricultural land. Instead it argues that the threat of liability for pesticide drift will increase the operating costs of other agricultural operations as they switch to less toxic pesticides or more precise application methods, and that “terpene taint” of grapes may affect the taste of wine. These are economic impacts that are not considered under CEQA.

There is no substantial evidence of a changed project, changed circumstances, or new information pursuant to Section 15162. Petitioner ignores the baseline and conditions placed on the Project. The Project was included in the baseline of the PEIR because it was on the County’s registry. This includes development or activity that exceeds what is allowed under existing regulations; whether RPI expanded its legal nonconforming use is irrelevant. This is not acknowledged anywhere in Petitioner’s analysis. Nor does Petitioner acknowledge the many Project conditions that reduce any potential for “conflicts” with neighboring agricultural uses.

Petitioner has ignored the stringent requirements of Section 15162. Even if the PEIR were invalid or in some way defective, Petitioner’s challenges under CEQA are limited to the legality of the agency’s decision about whether to require a subsequent or supplemental EIR, or subsequent negative declaration, and the underlying EIR or negative declaration may not be attacked. CEQA limits the circumstances under which a subsequent or supplemental EIR must be prepared. These limitations are designed to balance CEQA’s central purpose of promoting consideration of the environmental consequences of public decisions with interests in finality and efficiency. Section 21166 comes into play because in-depth review has already occurred as an existing legal nonconforming medical marijuana cultivation site. The time for challenging the sufficiency of the original EIR has long since expired and the question is whether circumstances have changed enough to justify repeating a substantial portion of the process. (*Bowman v. City of*

Petaluma (1986) 185 Cal.App.3d 1065.)[4] Once an EIR is finally approved, a court generally cannot compel an agency to perform further environmental review for any known or knowable information about the project's impacts omitted from the EIR.

Petitioner argues that substantial evidence supports the existence of substantially increased environmental effects from the changes to the administration of the County's Agricultural Preserve Program, which also constitutes new information of substantial importance separately justifying subsequent environmental review. Petitioner's argument is based on the false premise that the PEIR assumed that cannabis cultivation would be defined as a compatible use rather than an agricultural use under the Williamson Act.

Petitioner claims that pesticide drift from other properties onto the Project should be analyzed under CEQA. This is the Reverse CEQA analysis that has been rejected. (See *Ebbetts Pass Forest Watch v. California Dept. of Forestry & Fire Protection* (2008) 43 Cal.4th 936, 955-956 (discussing potential effects of herbicides use by proposed project on aquatic environment, soils, animals, and plants).) Petitioner cites no evidence that the Project exacerbates the adverse environmental impacts of pesticides. To the contrary, Petitioner's allegation is that the Project will lead to more targeted and/or less toxic pesticide application by other agricultural operations. The only Project-specific evidence of pesticide drift cited by Petitioner is a letter from Amy Steinfeld, counsel for RPI, to Jim Soares of Nutrient Ag Solutions, Inc., informing him that Sara Rotman had observed Nutrient spraying the neighboring property on a windy day. Ms. Steinfeld asks Mr. Soares to provide notice of future spraying, and states that she will file complaints with the Agricultural Commissioner, State Structural Pest Control Board, and pursue reimbursement for any damaged crops if he fails to provide such notice. Petitioner did not cite the evidence in the record demonstrating that this issue has been amicably resolved. RPI provided the owner of the land with a Memorandum of Understanding agreeing not to hold him, his tenant or the spray vendor liable, and the owner submitted oral and written comments supporting the Project. Petitioner also fails to cite the evidence that RPI regularly test their perimeter fence for pesticide residue and there have been no incidents of overspray.

Evidence of the alleged effect of terpenes on grapes is speculative, is not connected

[4] The Court has not ignored the arguments Petitioner made to the applicability of this case.

to the Project and is not new information. Comments received by the County raised the possibility of wine taint when nearby cannabis plants and the accompanying odors affect the long-time winery's crops and interfere with their use of the land. In response, the PEIR notes that Section 3.2, Agricultural resources, analyzes agricultural concerns related to cannabis cultivation and compatibility with existing agricultural resources. Comments were also received regarding conflicts with traditional agricultural practices.

The PEIR recognizes that odor from cannabis is primarily caused by terpenes. It explains that there are effective odor control technologies for both indoor and outdoor cannabis operations. It explains that an Odor Abatement Plan would not be required in AG-II areas given the extensive protections for agricultural practices within these areas are protected by the Right to Farm Ordinance, the absence of urban, inner-rural, or Existing Developed Rural Neighborhood areas with associated residential uses, and the prevalence of more intensive agricultural practices already allowed within this zoning district. AG-II was also exempt from the OAP requirement because of the innate need for the protection of agricultural land.

The PEIR stated that the source of a nuisance odor could easily be pinpointed with current commercial devices and the OAP could be enforced. Petitioner argues that conflicts have arisen between cannabis cultivators and wine producers over the potential for cannabis grown near wine grapes to deposit terpenes on grape skins, tainting the quality and saleability of wine produced from those grapes. But speculation is not substantial evidence. RPI provided site-specific odor studies of the Project, each generally concluding that no terpenes could be detected outside of the boundaries of the property. The Board found no credible evidence of alleged "terpene taint."

Substantial evidence supports the County's decision. As described in Attachment 1 to the CEQA Checklist, the Project site is zoned AG-II-40, which was one of the zones that was evaluated for proposed cannabis cultivation activities in the PEIR. The Santa Ynez region in which the Project is located was one of the five regions identified in the PEIR for organizing the data and analyzing the impacts of the Program. The PEIR analyzed the impacts of outdoor cultivation, indoor cultivation, and processing of cannabis products on AG-II zoned lots within the Santa Ynez region. The PEIR anticipated that certain areas in which cannabis activities historically have occurred, such as the Santa Ynez region, would continue to experience concentrated cannabis activities under the Program.

The Program that was analyzed in the PEIR did not include a cap or other requirement to limit either the concentration or total amount of cannabis activities that could occur within any of the zones that were under consideration for cannabis activities. After the PEIR was certified, the County placed a cap of 1,575 acres on cannabis cultivation in the unincorporated area outside of the Carpinteria Agricultural Overlay. The Project's proposed agricultural activities and processing facilities, including hoop structures, greenhouses, and barns are standard agricultural practices in the Santa Ynez region and the AG-II zone district. There is nothing unusual about the Project site, and, in fact, the Project site has previously been used for cultivating cannabis and row crops.

There are no unique features of the Project such that the Project could cause more severe impacts than shown in the PEIR. There is also a lengthy analysis of why the Project is within the scope of the PEIR in the March 17, 2020, letter from Planning and Development to the Board, including that there is insufficient scientific information to determine to what degree (if at all) terpenes from cannabis can adversely affect agricultural crops which might be exposed to cannabis terpenes.

The statute of limitations has run on challenging the PEIR and the amendments to the Uniform Rules. Petitioner's assertion that additional environmental review of alleged agricultural land use conflicts is required is a disguised and untimely challenge to the adequacy of the PEIR's analysis. (See *A Local & Regional Monitor v. City of Los Angeles* (1993) 12 Cal.App.4th 1773, 1794 [The assertion that a subsequent or supplemental EIR is required is seen by this Court as a disguised challenge to the EIR's original traffic analysis.]) Petitioner cannot attack the underlying PEIR, which is conclusively presumed to be legally adequate pursuant to Public Resources Code, § 21167.2 "unless the provisions of Section 21166 are applicable." This presumption acts to preclude reopening of the CEQA process even if the initial EIR is discovered to have been fundamentally inaccurate and misleading in the description of a significant effect or the severity of its consequences. After certification, the interests of finality are favored over the policy of encouraging public comment.

Petitioner's Uniform Rules arguments are a time-barred facial challenge to the Uniform Rules, not a Project-specific impact. The amendments to the Uniform Rules merely implement what was contemplated in the PEIR. Accordingly, Petitioner should have raised its challenges to the Uniform Rule amendments before the PEIR was certified, or, at the very latest, when the amendments were adopted.

The County conducted a legally sufficient site-specific review of the Project. The CEQA Guideline for program EIRs authorizes and encourages but does not require the use of a checklist to evaluate later activities involving site-specific operations. CEQA does not impose any particular procedural requirements on agencies performing a Section 15168 analysis. Petitioner can challenge the County's decision for lack of substantial evidence. CEQA findings are not required in this case because no hearing was required by law for the County's determination that the Project is within the scope of the PEIR. Even if findings were required under CEQA and needed to bridge the analytic gap between the raw evidence and ultimate decision, this standard has been satisfied. Findings need not be stated with judicial formality. Findings must simply expose the mode of analysis, not expose every minutia. Findings that bridge the analytical gap can be found in transcripts, staff reports, oral comments, and the language of a motion or resolution.

Petitioner's arguments related to CEQA fail.

Petitioner's Allegations re: Violations of the Williamson Act

In enacting the Williamson Act, the Legislature found the preservation of a maximum amount of the limited supply of agricultural land is necessary to the conservation of the state's economic resources, and is necessary not only to the maintenance of the agricultural economy of the state, but also for the assurance of adequate, healthful and nutritious food for future residents of this state and nation. *Gov. Code § 51220(a).* The Legislature found the Williamson Act is necessary for the promotion of the general welfare and the protection of the public interest in agricultural land. A violation of the Williamson Act is established if the County has not proceeded in the manner required by law, the order or decision is not supported by the findings, or the findings are not supported by substantial evidence. Whether the County complied with the Williamson Act including Gov. Code §§ 51231 and 51238.1(a) by approving the Project without reviewing its compliance with the Williamson Act's principles of compatibility, is a question of law that is reviewed de novo without deferring to the Board.

Argument #5. County erred in approving the Project without compatibility review. The Board's 2018 decision to classify cannabis cultivation as an agricultural commodity for purposes of administration of the County's Agricultural Preserve Program does not mean the Board may forgo considering the consistency of cultivated cannabis with the principles of compatibility. *See County of Colusa, 145 Cal.App.4th at 654.* The County was presented with substantial evidence from the agricultural community documenting how cannabis cultivation at the Busy Bee's parcel has impaired agricultural operations on other contracted lands in Agricultural Preserves and Petitioner and others repeatedly decried APAC's failure to review Busy Bee's proposed cannabis cultivation for consistency with the principles of compatibility. The Board's failure to evaluate the Project's consistency with the principles of compatibility, including compatibility with agricultural operations on other nearby contracted lands, is contrary to Gov. Code §§ 51231 and 51238.1(a).

The Court's Analysis of Petitioner's Williamson Act Arguments

The statute of limitations has passed to challenge the APAC's decision. APAC found the Project to be compatible with the Uniform Rules on January 11, 2019, and again on October 4, 2019. APAC is responsible for administering the County's Agricultural Preserve Program and the Uniform Rules. The County does not provide for an administrative appeal of APAC decisions. The County Code provides that Code of Civil Procedure section 1094.6 shall be applicable to the judicial review of any decision of the County of Santa Barbara or of any commission, board, officer or agent thereof. § 1094.6 provides for a 90-day statute of limitations. This case was filed well beyond the statute of limitations.

The "Principles of Compatibility" do not apply to agricultural uses. The parties have already extensively briefed the issue of whether cannabis could be considered an "agricultural commodity" under the Williamson Act. This Court ruled that *"[b]ased upon the text of the statute and this legislative history, a reasonable construction of section 51201, subdivision (a), is that commercial cannabis is a qualifying 'agricultural commodity' within the meaning of the Williamson Act at least, as here, when a local government implementing the Williamson Act so permits."* Petitioner is attempting to relitigate this issue; its arguments are rejected for the reasons stated in the prior briefing and this Court's ruling.

Moreover, the determination of what constitutes a compatible use under the Williamson Act has been left largely to the discretion of local governments:

"Compatible use" is any use determined by the county or city administering the preserve pursuant to Section 51231, 51238, or 51238.1 or by this act to be compatible with the agricultural, recreational, or open-space use of land within the preserve and subject to contract. <u>"Compatible use" includes agricultural use</u>, recreational use or open-space use unless the board or council finds after notice and hearing that the use is not compatible with the agricultural, recreational or open-space use to which the land is restricted by contract pursuant to this

chapter." (Gov. Code, § 51201(e).) Underlining emphasis by this Court. Thus, by default, an agricultural use is compatible.

Petitioner argues that *County of Colusa v. California Wildlife Conservation Bd.* (2006) 145 Cal.App.4th 637 and *Cleveland National Forest Foundation v. County of San Diego* (2019) 9 Cal.App.5th 1021 support the conclusion that the "Principle of Compatibility" in Gov. Code, § 51238.1 apply to agricultural uses, including cannabis cultivation. This Court does not agree with Petitioner's analysis or its conclusions.

In this case the Project site had been used for agriculture for more than 20 years. RPI proposed to continue using the site for agriculture. Even if Uniform Rule 2-1.1 "Principles of Compatibility" applied, Petitioner has pointed to no evidence before APAC that the Project would significantly compromise the long-term productive agricultural capability of other parcels or displace or impair current or reasonably foreseeable agricultural operations on other parcels or will result in significant removal of adjacent contracted land from agricultural use. There is no evidence that terpene taint of grapes, even if it were shown to exist, would lead to the conversion of vineyards to urban uses due to unprofitability. Similarly, there is no evidence that the threat of liability for pesticide overspray will lead to the conversion of agricultural land to urban uses. The substantial evidence test applies to the Court's review.

Petitioner's arguments related to the Williamson Act fail.

Petitioner's Allegations re: Violations of Planning and Zoning Law

The County is required to make administrative findings in approving land use entitlements, including the Land Use Permit at issue here. The County's LUDC requires a specific finding that the subject property is in compliance with all laws, regulations, and rules pertaining to uses, subdivisions, setbacks and any other applicable provisions of this Development Code, and any applicable zoning violation enforcement fees have been paid as a prerequisite to approval.

In reviewing whether the County has complied with the LUDC, the Court applies an abuse of discretion standard and determines whether the findings are supported by substantial evidence, whether the findings are in compliance with all statutory and regulatory criteria and requirements, and whether they bridge the analytic gap between the raw evidence and the ultimate decision. *Orinda Ass'n v. Bd of Supervisors (1986) 182 Cal. App. 3d 1145*. A determination is not supported by substantial evidence where based on the evidence before the local governing body, a reasonable person could not have reached the same conclusion. *Families Unafraid v. Board of Supervisors (1998) 62 Cal.App.4th 1332, 1338*. However, an agency's view of the meaning and scope of its own ordinance does not enjoy deference when it is clearly erroneous or unauthorized. *Sierra Club v. County. of San Diego, 231 Cal.App.4th at 1172*.

Argument #6. Illegal expansion of legal nonconforming use. The County's LUDC prohibits the expansion of a nonconforming use of land. LUDC § 35.101.020.B. When the Project came before the Planning Commission, Petitioner introduced evidence establishing that the Busy Bee's cannabis operation expanded significantly after January 19, 2016, and accordingly was in clear violation of LUDC § 35.101.020 and Article X § 35-1003. Petitioner argued that this prevented the Commission from making the finding required by LUDC section 35.82.110.E.1.c that the subject property is in compliance with all laws, regulations, and rules pertaining to uses, subdivisions, setbacks and any other applicable provisions of this Development Code, and any applicable zoning violation enforcement fees have been paid. The County and Real Party did not dispute the evidence Petitioner introduced. In response to Petitioner's argument, the County took the position that because Busy Bee's submitted an application for a LUP in November 2018, with approval of the LUP as conditioned, the proposed project will be in full compliance with all laws, rules, and regulations for cannabis cultivation within the AG-II zone district. Additionally, all processing fees have been paid to date. Because no Notice of Violation was issued, there were no zoning violation enforcement fees or processing fees paid.

Argument #7. The Board's finding is based on a clearly erroneous interpretation of County requirements and is not supported by substantial evidence in the record. An agency's view of the meaning and scope of its own ordinance does not enjoy deference when it clearly erroneous or unauthorized. *Sierra Club v. County of San Diego*, 231 Cal.App.4th at 1172. The County cannot interpret its own ordinance contrary to its expressed terms. The County's interpretation of LUDC § 35.82.110.E.1.c, and LUDC § 35.101.020 and Article X § 35-1003 regarding nonconforming uses is contrary to its express terms, clearly erroneous and not authorized by the LUDC and the County's overall regulatory framework for cannabis.

The Court's Analysis of Petitioner's Arguments re Planning and Zoning Law

The County's interpretation of LUDC Section 35.82.110.E.1.c is entitled to substantial deference. Under well-established law, an agency's view of the meaning and scope of its own ordinance is entitled to great weight unless it is clearly erroneous or unauthorized. The County's interpretation of LUDC Section 35.82.110.E.1.c is entitled to great deference because, as the author of the LUDC, it is intimately familiar with it, and sensitive to the practical implications of one interpretation over another. Deference is also appropriate because the County has expertise and technical knowledge of the LUDC, which is technical, obscure, complex, open-ended, and entwined with issues of fact, policy, and discretion. The County also drafted the Comprehensive Plan, which the LUDC implements, as well as the planning and zoning administration provisions in the County Code. It therefore has a better understanding than the Court of how these various land use provisions are intended to work.

Additionally, the approval of the LUP cured any alleged violation for expansion of legal nonconforming use. As conditioned, the Project is compliant with all laws, rules and regulations pertaining to zoning, allowed uses, subdivisions, setbacks and all other applicable provisions of the LUDC. Petitioner has not argued otherwise or cited any evidence to the contrary. A zoning violation does not impose on the County a duty to enjoin the continued use of the property. This is in part because the police power that gives the municipality authority to establish zoning ordinances in the first place also allows the municipality to change that zoning.

The County Code, which specifically addresses legal nonconforming cannabis cultivation, provides violators with an opportunity to correct or end any violation. If a violator fails to abate the violation, the County has the discretion to choose from a variety of enforcement option, including civil actions and penalties, and criminal actions and penalties. Nothing requires the County to investigate alleged violations of legal nonconforming use or prohibits the County from issuing a permit for uses that comply with the Cannabis Regulations. Local governments have the discretion to decide how to allocate their limited budgets, including by focusing their efforts on bringing properties into compliance rather than investigating past violations of legal nonconforming use by those satisfying the zoning restrictions and development standards under the Cannabis Regulations. The substantial evidence test applies to the Court's review of the County's decision.

Petitioner's arguments related to the Violations of Planning and Zoning Law fail.

The Court's Summary

Petitioner's CEQA and Williamson Act claims must fail because cannabis cultivation is an agricultural use. County and RPI's arguments are not overbroad. The argument made by County and RPI that the Project is within the scope of the PEIR is very persuasive. The Court agrees with County and RPI's characterization that agricultural land use conflicts and the ensuing physical impacts are solely economic and neither CEQA nor the Williamson Act are designed to protect surrounding agricultural operations from such economic impacts. The other legal and fact-based arguments made by County and RPI are valid.

Petitioner's Reply was not persuasive to this Court. The response to the RPI criticism that Petitioner should have instituted earlier legal challenges to either the PEIR or Uniform Rules amendments is irreconcilable with the facts and the applicable law. Petitioner relies on the argument that it did not exist when these approvals took place; it was "formed in May 2019 after it became apparent that the County's administration of its Cannabis Program was having substantially more severe impacts than disclosed in the PEIR." *If that were the guideline, there would never be an end to such litigation because there would be an endless line of litigants each of whom were "newly formed."*

Despite the vigorous argument made that the Opposition to Petitioner's CEQA and Williamson Act stance related to cannabis cultivation is an agricultural use is in error, *this Court finds that issue has been exhaustively briefed. The Opposition is persuasive*. Cannabis does not differ significantly from other agricultural uses allowed on Williamson Act contracted lands. *The Court has weighed, considered and rejected the Petitioner's contentions made that the Writ should be granted because*, unlike other agricultural crops, cannabis may not be cultivated without County issuance of a discretionary Land Use Permit; is subject to annual license renewals; is psychoactive; is an illegal controlled substance under federal law; presents security and law enforcement challenges; creates strong persistent malodors that many find more objectionable and intense than odors reported to induce headaches, exacerbate asthma; results in other adverse health consequences.

The Court did not find County's and RPI's arguments overbroad as to prior classification of an agricultural use or *de facto* inconsistent with the Williamson Act's Principles of Compatibility. The Court disagrees with Petitioner that County failed to address the argument that the PEIR lacked site-specific review and deferred consideration of agricultural land use conflicts to later review of individual projects including through APAC review. Additionally, RPI's argument that the requirement no longer applies since the County updated its Uniform Rules was persuasive. County and RPI's explanation that agricultural land use conflicts and the ensuing physical impacts are solely economic and neither CEQA nor the Williamson Act are designed to protect surrounding agricultural operations from such economic impacts has been considered; weighed; found persuasive. The Court disagrees with Petitioner that the other legal and fact-based arguments made by County and RPI are unfounded.

Petitioner's contention that the County's approval of the Project constituted a prejudicial abuse of discretion and must be set aside *should be denied*.

Petitioner's request that the Court direct County to conduct such focused environmental review as is necessary to identify and mitigate agricultural conflicts such as those presented in this case and to revise the Uniform Rules to ensure a process to review compatibility issues and to otherwise conform to the Williamson Act *should be denied*.

Petitioner's request for a declaration that Real Party impermissibly expanded non-conforming uses on the property and to direct the County to take appropriate action in accordance with applicable authority *should be denied*.

Thomas P. Anderle, Judge

A Sustainability Leader, Santa Barbara County Is the Wine Region of the Year | Wine Enthusiast's 2021 Wine Star Awards

BY MATT KETTMANN

SAARLOOS AND SONS VINEYARD, BALLARD CANYON / PHOTO BY GEORGE ROSE

With a stunning diversity of microclimates, a thriving culinary scene and a small yet cosmopolitan seaside city as its cultural core, Santa Barbara County is a wine lover's paradise.

Whether you prefer Chardonnay from the Santa Maria Valley, Pinot Noir from the Sta. Rita Hills, Syrah from Ballard Canyon, Sauvignon Blanc from the Los Olivos District, Cabernet Sauvignon from Happy Canyon or even Gamay Noir from Alisos Canyon, there's an appellation and grape variety for every palate, thanks to a unique geography of valleys that open directly onto the cold Pacific Ocean.

The same diversity exists for tasting experiences—lavish estates, cozy cottages, urban warehouses and waterfront tables are all within a short drive of each other.

Santa Barbara County is also a leader in sustainability, as it is home to some of the country's first organic, biodynamic and regenerative vineyards.

But people count here, too. There's a higher proportion of female winemakers in this region than anywhere else in California. Additionally, an increasing number of wineries elevate visibility of and opportunities for farm workers through special bottlings and scholarships.

For these reasons and more, Santa Barbara County is the 2021 Wine Star Award winner for Wine Region of the Year.

"We're absolutely thrilled to have been selected as the top winemaking region and destination this year, especially among such a brilliant group of regions," says Alison Laslett, CEO of Santa Barbara Vintners (Santa Barbara County Vintners Association). "Santa Barbara County has always offered incredible options when it comes to growing and creating some of the finest wines in the world. We love seeing our region achieve an international reputation among wine enthusiasts and newcomers alike."

Tim Snider, board member of Santa Barbara Vintners and president of Fess Parker Winery, believes that the past two decades of learning were critical to Santa Barbara County's evolution.

"We've learned where the best places are to grow specific varietals, our vineyards have matured and our winemakers understand how to work with the fruit," says Snider. "In my opinion, the overall quality and balanced style of Santa Barbara wines has never been better."

He also credits the region's highly regulated zoning for positive results, despite the challenges.

"Our communities have done really well at balancing the growth of tasting rooms, new restaurants and high-end accommodations without compromising our down-to-earth, small-town atmosphere," he says. "This is a great place to get away and recharge—it is still easy and approachable."

Nicholas Miller, also a board member for Santa Barbara Vintners as well as vice president of sales and marketing for his family's brand, The Thornhill Companies, agrees that now is the region's time to shine. His family has been a part of the Central Coast wine scene for five generations and planted the iconic Bien Nacido Vineyard nearly 50 years ago.

“My family has been farming in the Santa Maria Valley since the early 1970s, and I don’t think we’ve ever seen such an exciting time in the Santa Barbara wine industry as we see today,” he says. “For as closely knit and unified as we are as a region, we are equally diverse.”

Calling the Wine Star Award a “tremendous honor,” Miller says, “we are all aware of what a geographically small region we are in the wine world, so to receive recognition like this certainly is an affirmation for what we are all trying to accomplish across Santa Barbara County.”

HYDROLOGY REPORT

Of the property at

4651 SANTA MARIA MESA ROAD, SANTA MARIA, CA

Prepared for:

CANNA RIOS, LLC

Prepared by:

Walch Geosciences
1517-O Stowell Center Plaza
Santa Maria, CA 93458

Updated December 8, 2021

HYDROLOGY REPORT

I. INTRODUCTION

This report presents the results of a hydrologic study conducted for Canna Rios LLC, for the parcel at 4651 Santa Maria Mesa Road, Santa Maria, California (Figure 1). The purpose for the study is to evaluate if irrigation water use for the proposed cannabis cultivation activities on the property will impact the adjacent Cuyama and Sisquoc rivers. The study has been conducted to comply with permitting requirements by the California Department of Fish and Wildlife specifically regarding impacts to river flow ("surface water") that may be a result of pumping groundwater and the State Water Resources Control Board (SWRCB) forbearance limitations on diversions of surface water to irrigate cannabis crops during certain times of the year.

The proposed cannabis operations will occupy 46.29 acres of outdoor cannabis cultivation and 1.45 acres of cannabis nursery in the north portion of the parcel (project site), identified as Santa Barbara County Assessor's Parcel Number (APN) 129-040-010, -018, and 129-030-022. This parcel consists of 431.4acres and is in the southwest one-quarter of Section 36, Township 10 North, Range 33 West, San Bernardino Base and Meridian (36-T10N/R33W, SBB&M) (Figure 2).

II. REGIONAL SETTING

The project site lies within the eastern portion of the Santa Maria Valley at the confluence of the Cuyama and Sisquoc rivers, just east of Fugler Point (Figure 1). The Santa Maria Valley is a large coastal valley in California situated about 120 miles northwest of Los Angeles and 60 miles northwest of Santa Barbara. It is in the northwestern part of Santa Barbara County and the southwestern part of San Luis Obispo County and includes the alluvial plains and adjoining terraces, foothills and mountain slopes (Worts, 1951). East of Fugler Point, the alluvial plain of the Sisquoc River is smaller and extends upriver about 8 miles. The Cuyama River in this area has no appreciable alluvial plain.

The alluvial plains and terraces are bounded by the San Rafael Mountains on the north and the Solomon Hills to the south. Between the mountains and hills, which are composed primarily of consolidated rocks, the alluvial plains and terraces are underlain by a large mass of unconsolidated water-bearing deposits within which the aquifers supplying water to the Santa Maria Valley are contained. The alluvial plains and adjacent relatively elevated terraces have been extensively cultivated, and the multiple groundwater aquifers supply water for irrigation as well as public supply and industrial use throughout the Valley.

Topography

The project site is located in the eastern portion of the Santa Maria Valley adjacent to the lowermost stretch of the Cuyama River and near the confluence of the Cuyama and Sisquoc rivers, Topography at the site is flat and the land is about 360 feet above sea level (Figure 2). About 400 feet north of the site is the channel of the Cuyama River. North of the river at this point, the topography rises steeply to the foothills of the San Rafael Mountains. Five hundred feet or more southwest of the site is the Sisquoc Riverbed; the adjoining floodplain of the Sisquoc River Valley extends to the south and southeast. The Cuyama and Sisquoc rivers join about 1,500 feet west of the project site, and the combined riverbed, at this point named the Santa Maria River, extends to the northwest. To the west, the topography rises gently to terraces of the Santa Maria River.

Geology

The Santa Maria Valley is a wedge-shaped sedimentary basin bounded on the north by the Santa Lucia Range and San Rafael Mountains and on the south by the Casmalia and Solomon Hills. The basin is floored by Mesozoic rocks of the Franciscan complex, along with ophiolite and sedimentary sequences. In the center of the basin, lower Miocene nonmarine sediments of the Lospe Formation are present, shed from uplifted blocks along basin-forming faults. Overlying these nonmarine deposits are deep-water marine, clastic-poor rocks of the Point Sal and Monterey Formations which were deposited over much of the area, filling in early Miocene lows and onlapping structural highs. Uppermost Miocene to Quaternary marine and nonmarine clastic units (Sisquoc, Foxen, Careaga and Paso Robles formations) document filling of the basin and emergence of the flanking uplifts (Tennyson, 1995). Quaternary strata of the Orcutt Sand and younger alluvium and surficial sediments were deposited in fluvial and coastal environments overlying the Paso Robles and older formations.

Structurally, early extensional tectonics of the Late Cretaceous through early Miocene opened the basin and allowed the thick sequences of the nonmarine and marine rocks of Cretaceous to Late Miocene age to be deposited. The extensional tectonics gave way to later compressional tectonics of late Miocene to Quaternary, resulting in the north-south to northeast-southeast crustal shortening taking place throughout the area.

In the project area, Miocene and older rocks found in the subsurface beneath the Santa Maria Valley have been uplifted northeast of the property and are exposed in the foothills of the San Rafael Mountains (Figure 3). Pliocene and younger sediments thin towards these foothills, and appear to be offset by the West Huasna/Foxen Canyon Fault which has been mapped underlying the Pleistocene Paso Robles beneath the southern portion of the parcel (Figure 3). This fault appears to be a major boundary for the Santa Maria sedimentary basin. The Paso Robles and younger alluvial and stream bed deposits are flat lying beneath the property and do not appear to have been subjected to tectonic movements since deposition. Figure 4 is a cross section from northwest to southeast through the Canna Rios parcel which illustrates the Miocene and younger stratigraphic units beneath the project site.

III. GROUNDWATER CONDITIONS

As indicated above, groundwater in the project site is contained within multiple aquifer zones or layers. Sediments which comprise the aquifer bodies underlying the Santa Maria Valley are of Pliocene to Recent age and consist of the Careaga Sand, Paso Robles Formation, Orcutt Sand, terrace deposits, alluvium and river channel deposits. These sedimentary bodies overlie older, consolidated fine- and coarse-grained rocks including the Foxen, Sisquoc, Monterey Shale, Pt Sal and Lospe formations, which in turn are underlain by basement rocks. These older non-water bearing rocks were deposited in a rapidly subsiding basin during the middle to late Tertiary. In the project area, the Careaga, Paso Robles, Recent alluvium and river channel deposits are present as the water-bearing units (Figure 4).

<u>Careaga Sand</u>

The Careaga Sand of Pliocene age is the oldest water-bearing formation and overlies older Pliocene consolidated rocks. The Careaga consists of loosely consolidated medium- to fine-grained marine sand with some silt and occasional gravel lenses. It is widespread in the subsurface of the Santa Maria Basin, reaching thicknesses of up to 650 feet, but thins and pinches out along the north side of the basin approaching the West Huasna and Santa Maria River Faults. Beneath the project site, the Careaga is present southwest of the West Huasna Fault and is about 240 feet thick (Figure 4). Permeability in the Careaga is reported at about 70 gallons per day per square foot (Worts, 1951).

Paso Robles Formation

The Paso Robles Formation of Pleistocene age overlies the Careaga Sand. It is somewhat compacted and comprised of gravel, sand, clay and silt beds that occur in discontinuous lenticular bodies. The discontinuous silt and clay beds, in places, can act as semi-confining layers within the aquifer. Throughout the basin, the Paso Robles is widespread and ranges in thickness from near zero up to 2,000 feet. At the project site, the Paso Robles is about 125 feet below ground surface and 180 feet thick. Permeability is about 65 gallons per day per square foot or more in the project area.

Alluvium

The alluvium at the project site unconformably overlies the Paso Robles Formation and is of Recent age. It consists of unconsolidated gravel, sand, silt and clay of fluvial origin. The alluvium is about 100 feet thick and yields water to wells in quantities up to 2,200 gallons per minute. The permeability is 2,000 to 4,500 gallons per day per square foot based on well tests (Worts, 1951).

River Channel Deposits

River channel deposits are unconsolidated and of Recent age, consisting of gravel, sand and some silt in the Cuyama and Sisquoc Rivers. River channel/stream deposits immediately underlie the site and are difficult to differentiate from the underlying alluvium, but most likely are no more than 25 feet thick (Worts, 1951). Permeability ranges from 154 to 1,060 gallons per day per square foot. According to Worts (1951), enormous seepage losses from the Sisquoc River (and farther downstream, the Santa Maria River) take place through these deposits.

In the southeastern portion of the Santa Maria Valley, the Paso Robles Formation is overlain by the Orcutt Sand; however, in the project area, Recent alluvium lies directly over the Paso Robles. The water-bearing sediments in the Santa Maria Valley, especially along the southern axis of the valley, can obtain a thickness of up to 2,500 feet. In the project area, the thickness of the water-bearing deposits ranges from about 200 feet to 1,200 feet (Figure 4).

IV. SURFACE WATER CONDITIONS

The drainage system for both the Cuyama and Sisquoc rivers encompasses about 1,600 square miles upstream from the confluence of the two rivers east of Fugler Point (Thomasson, 1951). West of the confluence, the merging rivers empty into the Santa Maria River. Water runoff from most of the Cuyama River drainage system is controlled at Twitchell Dam, about 7 miles upstream from the project site. Prior to construction of Twitchell Dam, large quantities of runoff water were delivered to the Santa Maria River and Valley by the Cuyama River along with the Sisquoc River, and in times of flood, much water was wasted to the ocean. During periods of low or moderate flow, all or most of the water is absorbed by the river-channel deposits and contributed as recharge to the overall groundwater supply (Thomasson, 1951). During the growing season (March to October), neither river at the confluence contain flowing surface water.

Cuyama River

As indicated above, the Cuyama River is dammed approximately seven miles north of the subject property by Twitchell Dam. The dam was built by the Bureau of Reclamation in conjunction with the Core of Engineers and completed in 1958. The purpose of damming the Cuyama River was for conservation and flood control. Outflows from the reservoir behind the dam are used to replenish the Santa Maria Valley groundwater aquifers from which Santa Maria Water District customers pump all of their water supply. Currently, the Twitchell Reservoir holds most of the runoff water from the Cuyama drainage basin. Water is released at the dam in prescribed amounts for groundwater recharge in the Santa Maria Valley while precluding flow to the ocean.

Twitchell Dam and Reservoir

Twitchell Dam and Reservoir are operated by the Santa Maria Valley Water Conservation District and operations are conducted in accordance with provisions of a Stipulation entered in 2008 by the Superior Court of the Santa of California, County of Santa Clara (the Court) in the Santa Maria Valley Groundwater Basin litigation. Annual reports of the Twitchell Dam operations and groundwater monitoring are compiled by Luhdorff and Scalmanini Consulting Engineers (LSCE). The Stipulation specifies that on average, the Twitchell project adds 32,000 acre feet of water per year to the Santa Maria Valley Groundwater Basin. The actual annual releases from Twitchell Reservoir for in-stream groundwater recharge since 1967 have ranged from zero during low rainfall and drought years to a maximum of 243,660 acre feet in 1998 (LSCE, 2018). The average for this period, 1967 to 2018, has been 47,100 acre-feet per year (afy); from 1967 to 2001, releases averaged 59,300 afy, but during the most recent dry period from 2002 to 2018, releases averaged only 22,000 afy.

There is no gaging station at the confluence of the Sisquoc and Cuyama rivers near the project site, so the amount of discharge water seeping into the groundwater along the Cuyama River below the dam is unknown. However, according to LSCE, substantial recharge [to the groundwater basin] occurs along the portion of the Santa Maria River below the confluence of the Cuyama and Sisquoc rivers and upstream from Suey Crossing. In reviewing satellite images of the Cuyama River above the convergence with the Sisquoc River, it appears that much of the river has been channelized, in effect, limiting the amount of water seepage into the subsurface between Twitchell Dam and the Santa Maria River. Thus, the majority of seepage into the groundwater aquifers is below the confluence with the Sisquoc River.

LSCE have compiled the historical discharge from the Cuyama River and Twitchell Reservoir releases for the years 1959 through 2018. The chart summarizing these releases is duplicated in Figure 5. Note that for several years since 2001, there have been no surface water releases from Twitchell Reservoir (specifically 2002, 2003, 2004, 2007, 2009, 2010, 2013, 2014, 2015, and 2016) due to drier climatic periods.

Sisquoc River

The Sisquoc River is not dammed and the drainage basin extends to La Brea Creek, about 8 miles east of the confluence. The riverbed is up to 1,500 feet across in places and is only a few feet below the adjacent alluvial plain. The riverbed is almost devoid of vegetation and the adjacent alluvial plain has been extensively cultivated.

Stream Profiles

In the project area, the lower extents of both the Cuyama River and the Sisquoc River are losing, or influent streams; i.e., the bottom of the stream channel is higher in elevation than the local water table and water drains from the stream into the ground. The rate at which the stream water infiltrates into the ground is dependent upon the streambed material. In both the lower Cuyama and Sisquoc rivers, this material has been mapped as coarse gravel, sand and some silt (Worts, 1951). The material is unconsolidated and above the zone of water-table fluctuations; permeability, also called hydraulic conductivity, is 154 to 1000 gallons per day per square foot (calculated to be 20.6 to 134 feet per day). There are enormous seepage losses from the Sisquoc and Santa Maria Rivers through these deposits (Worts, 1951).

As a result of their studies and based on geology, groundwater levels and groundwater quality, LSCE (2019) divided the aquifer underlying most of the Santa Maria River Valley into a shallow aquifer zone and deep aquifer zone. They define the shallow zone as unconfined and comprised of the Quaternary Alluvium, Orcutt Formation and the uppermost Paso Robles Formation. The deep zone is considered semi-confined and is comprised of the remaining Paso Robles Formation and the Careaga Sand. In the Sisquoc Valley east of the project site, the formations are much thinner and comprised of coarser materials, and the aquifer is essentially uniform without distinct aquifer depth zones (LCSE, 2019). In the project area, however, LCSE (2019) has identified both zones and mapped each respectively.

Figure 6 is a stream profile of the lower Cuyama River from just below the confluence of the Cuyama and Sisquoc rivers to upstream of the project site (see Figure 3, B-B’). Groundwater elevation profiles have been drawn on the figure for both the shallow and deeper aquifers for the spring of years 2010, 2014, and 2018. The data is interpreted from groundwater elevation maps constructed by LSCE. Although LSCE has prepared groundwater elevation maps for Spring and Fall each year since 2010, the data depicted are representative of the range of elevations mapped during this 9-year period and of the higher groundwater elevations in the Spring. The groundwater elevation maps indicate that the top of groundwater in the shallow zone beneath the lower Cuyama River near the northeast corner of the subject parcel has ranged from 251 feet to 305 feet in elevation (89 feet to 55 feet below ground surface (bgs)) for all years plotted. For the deep zone at this same point, the range has been from 202 feet to 260 feet in elevation (158 feet to 100 feet bgs).

Worts (1951) displayed one groundwater elevation station, 35A1, present near the mouth of the Cuyama River near the confluence as having groundwater elevation of about 350 feet above sea level before the construction of Twitchell Dam. The ground elevation at this site is about 388 feet (38 feet from ground surface to top groundwater). This data suggests that, historically, the groundwater aquifer in the project area has consistently been below the ground surface elevation and confirms that the Cuyama River at or near the confluence with the Sisquoc River in the project area has continually been an influent, or losing, stream.

Figure 7 is a stream profile of the Sisquoc River from a few hundred feet southeast of the gaging station at the Garey bridge (Santa Maria Mesa Road) to its convergence with the Cuyama River (see Figure 3, C¬C’). As in the stream profile for a portion of the Cuyama River, groundwater elevations as mapped by LSCE for the years 2010, 2014 and 2018 for both the shallow and deep aquifer zones are shown on the profile along with the estimated tops of the subsurface formational units. Again, the groundwater elevation maps for the Sisquoc River at the gaging station indicate that the top of groundwater has ranged from 254 feet to 306 feet in elevation (121 feet to 70 feet) for the shallow zone and 205 feet to 261 feet in elevation (170 feet to 114 feet bgs) for the deep zone.

Figure 8 is a hydrograph of a well approximately 2-1/2 miles south of the project site that has been monitored for groundwater elevation by the USGS. The hydrograph shows the groundwater elevations from 1992 through 2018. The figure also indicates that the top of groundwater in this area has consistently been 80 feet or deeper beneath the ground surface.

Any water flowing in either river is subject to infiltration into the river bed. However, there does not appear to be a hydraulic connection between the lower aquifer (Lower Paso Robles and Careaga formations) and the upper aquifer (river channel deposits and alluvium), and there is no hydraulic connection between either of these units with the river alluvium. The top of groundwater in either aquifer layer is well below the streambed. Therefore, pumping groundwater from the underlying aquifer will not affect the amount or rate of infiltration of surface water into the subsurface. Even though pumping at times may lower the groundwater elevation in the well area, there is no lowering of pressure to cause a greater amount of water to infiltrate from either stream into the riverbed during low groundwater stands.

There is no hydraulic connection between the deeper aquifer (Lower Paso Robles and Careaga formations) and Cuyama and Sisquoc River alluvium, and the top of groundwater in both the shallow and deep aquifers is well below the streambed. Therefore, pumping groundwater from either aquifer will not affect flow of water in the stream or the amount or rate of infiltration of surface water into the subsurface and, thus, will have no impact on the adjacent rivers.

V. CANNABIS OPERATIONS

The proposed cannabis operations on the north portion of the subject parcel will consist of a nursery area of about 1.45 acres, an overall mature plant area of about 46.29 acres The operation will involve two harvests per year for a duration of approximately three weeks per harvest, not to exceed four weeks per harvest. The facility will be accessed via a private ranch road north of Santa Maria Mesa Road on the east side of the parcel. The facility is surrounded by various row crops, with part of the parcel farmed in blueberries and raspberries.

Cannabis cultivation will occur from February through October each year with two grows per year proposed. The first planting will be in March and the second planting will be in July. The growing season will be completed by November. The cannabis will have a water duty of approximately 2.2 AFY/acre for two crops per year. Therefore, the proposed groundwater demand for the Project is 105.6 AFY. Water will be pumped directly from the well (Well #2) for irrigation and no water storage is anticipated.

The source of water for irrigation for this project is from an existing well which taps into a large, regional aquifer with water available year-around. As discussed above, the water in both the shallow and deeper aquifer zones is not hydraulically connected to the surface flow in either the Cuyama or Sisquoc Rivers. Therefore, there is no impact to the rivers from drawing well water in the project area.

Source For Irrigation of Cannabis Farm

The existing well (Well #2) to be used for irrigation of the cannabis farm is about 1,000 feet north of Santa Maria Mesa Road just west of the main access to the property and project site. The well is located approximately 3050 feet from the Cuyama River and 2200 feet from the Sisquoc River. Well #2 is located at the following GPS coordinates; 34° 53’ 47.07” North, 120° 18’ 07.70” West.

The well was drilled in November of 2016 by Coast Drilling, Inc., of Grover Beach, California, under permit from the Santa Barbara County Environmental Health Division, Permit No. 0002567, State Well

Completion Report No. WCR2016-008549. A copy of the Well Completion Report is included in Attachment A.

The well was drilled to a total depth of 600 feet below grade and completed with 16-5/8” steel casing to 550 feet below grade. Wire-wrapped slotted screen was installed from 260 feet to 540 feet. The well was logged, and interpretation of this electric log along with well logs from nearby oil wells suggests that the completion interval in this well is in the lower portion of the Paso Robles Formation and the top of the Careaga Formation (see Figure 4). The lowermost few feet of the completed well appear to have intercepted the top of the Foxen Formation. Based on depth of completion and the completion formations, the well to be used for irrigation for the cannabis farm is completed in the deep groundwater zone. Figure 8, the hydrograph showing groundwater elevation variations with time, is based on a well completed in the deep zone.

The depth to first water in the well was logged at 89 feet below ground surface with a standing or static water level of 86 feet below ground. A four-hour well test apparently was conducted of the completed well which resulted in an estimated maximum water yield of 1,100 gallons per hour with 113 feet of total drawdown. Details of the pump test are not available; therefore, the drawdown rate and refresh (recharge) rate are not known.

In Exhibit 1 of the Summary of Appeal Issues prepared by Rogers, Sheffield & Campbell, LLP, Dr. McCord discusses the impact of well pumping at the Canna Rios Project site and uses several diagrams along with modeling to illustrate such impacts. This entire discussion along with his diagrams in Figure 9, however, are based on the Sisquoc River being an effluent, or gaining stream and assumes connected ground water. However, as discussed below, there is no connectivity between the seasonal and limited surface water in the Sisquoc River and the ground-water aquifer that will be tapped to support the Canna Rios Project.

United States Geological Service (USGS) records of surface water discharged in the Sisquoc River at the Garey gaging station over the past 10 years indicate that there has been no water flow in the river during the months of July, August and September and minimal flow for the months of April through December. These data support that the Sisquoc River, along with the Cuyama River below Twitchell Dam, are influent, or losing streams and that the water table is below the stream-bed surface. This is supported by graphs of historic water levels (Figures 6 and 7 of the Hydrology Report prepared by Walch Geosciences) which show a minimum of 50 feet of unsaturated sediments between the stream bed and the top of ground water. Thus, there does not appear to be surface water to ground water connectivity.

Additionally, the electric log of Well #2 shows higher resistivity (compared to resistivity of the ground water) from just above the surface seal in the well, at about 45 feet below ground surface, to just below 80 feet below ground surface. This high resistivity zone is above the static water level and is interpreted to reflect a vadose, or unsaturated zone between ground surface the top of the ground-water aquifer. There is no fluid in this zone and, therefore, no connected ground water. The concept of cascading water from surface sources to the well below the surface seal as shown in Dr. McCord’s Figure 6 is not justifiable.

If the well pump in Well @2 is set at just 100 feet below the ground-water surface (about 185 feet below ground surface) the hydraulic pressure at this point is estimated at about 43 psi. Pressure at ground surface is 0 psi. Systems under pressure will migrate from high pressure to low pressure. In an unconnected system, it does not appear reasonable, therefore, that percolating water from the seasonal flow in either the Sisquoc or lower Cuyama rivers would be increased by ground-water pumping.

Previous Cultivation Operations

Cultivation of the property for which the cannabis operations are proposed previously has included the growing of various row crops including broccoli, lettuce, and strawberries. These crops have been irrigated using overhead sprinklers, flood and drip line from the water-supply well near the northeast corner of the parcel as well as other water-supply wells on the parcel. Water use for these crops is estimated at 1.5 to 2.8 acre/feet of water per acre per growing season based on data found in government and university publications (Johnson and Cody, 2015; El-Farhan and Pritts, March 18, 2002; and LeStrange, et. al., 1996, 2010). Growing season for these crops, in general, ranges from about 90 days to 200 days; most of these crops can be grown year-around. Evaluations of these crop data suggest that water use for vegetable crops and the water use for cannabis are comparable, but because the project will be shrinking the footprint of cultivated area, the water demand will be considerably less than historic use.

VI. CONCLUSIONS

- The proposed cannabis activities will be located about 400 feet south of the Cuyama River near the confluence of the Cuyama and Sisquoc rivers.

- Groundwater beneath the site is confined within multiple aquifer layers consisting of Careaga Sand, Paso Robles Formation, Recent alluvium and river channel deposits.

- The Cuyama River is dammed approximately 7 miles north of the project site by Twitchell Dam and water discharged into the lower part of the river is controlled in accordance with a Court Stipulation.

- Average releases from Twitchell Dam during the most recent dry period, between 2002 and 2018, averaged 22,000 acre feet per year. Most of this discharged water flows to the Santa Maria River west of the site for groundwater recharge.

- LCSE (2019) recognized a shallow and deep aquifer zone in the Santa Maria Groundwater Basin at the project site. The stream profiles prepared for both the Cuyama River and Sisquoc River illustrate that the top of groundwater below ground surface ranges between 55 feet and 121 feet for the shallow zone and 100 feet to 170 feet for the deep zone.

- Water flowing in either the Cuyama or Sisquoc Rivers is subject to infiltration into the river bed. There is no hydraulic connection between the deep aquifer (Lower Paso Robles and Careaga formations) and Cuyama and Sisquoc River alluvium. The top of groundwater in both the shallow and deep aquifers is well below the streambed. Pumping groundwater from either aquifer will not affect the flow of surface water or the amount or rate of infiltration of surface water into the subsurface and, thus, will have no impact on the adjacent rivers.

- The proposed cannabis operations will occupy about 46.29 acres in the north portion of the subject parcel. Expected water use will be approximately 2.2 AFY/acre for two crops per year. Therefore, the proposed groundwater demand for the Project is 105.6 AFY, less than historical use...

- Previous cultivation of the parcel has been to grow hemp, broccoli, lettuce and strawberries and water requirements for these crops is comparable to the water requirements for the proposed cannabis operations.

VII. PROFESSIONAL CERTIFICATION

This report has been prepared and reviewed by a geologist registered in the State of California whose signature and registration number appear below.

Carolyn A. Walch

California Registered Geologist No. 4011

VII. REFERENCES

Dibblee, Thomas W., Jr., 1994, Geologic Map of the Santa Maria and Twitchell Dam Quadrangles, Santa Barbara and San Luis Obispo Counties, California: Dibblee Geologic Foundation Map #DF-31.

El-Farhan, A. H., and Marvin Pritts, March 18, 2002, Water Requirements and Water Stress in Strawberry, The New York Berry News, Vol. 1, No. 1.

Johnson, Renee and Betsy A. Cody, June 30, 2015, "California Agricultural Production and Irrigated Water Use, Congressional Research Service, Report R44093.

LeStrange, Michelle, Michael D. Cahn, Steven T. Koike, Richard E. Smith, Oleg Daugovish, Steven A. Fennimore, Eric T. Natwick, Surendra K. Dara, Etaferahu Takele and Marita I. Canwell, 1996, 2010, "Broccoli Production in California, The Regents of the University of California Agriculture and Natural Resources, Publication 7211.

Luhdorff and Scalmanini Consulting Engineers, April 10, 2019, "2018 Annual Report of Hydrogeologic Conditions, Water Requirements, Supplies and Disposition, Santa Maria Valley Management Area."

Thomasson, H. G., Jr., 1951, "Surface-water Resources," in Worts, G. F., Jr., 1951, Geology and Ground-Water Resources of the Santa Maria Valley Area, California: U. S Geological Survey Water-Supply Paper 1000.

Worts, G. F., Jr., 1951, Geology and Ground-Water Resources of the Santa Maria Valley Area, California: U. S Geological Survey Water-Supply Paper 1000.

FIGURES

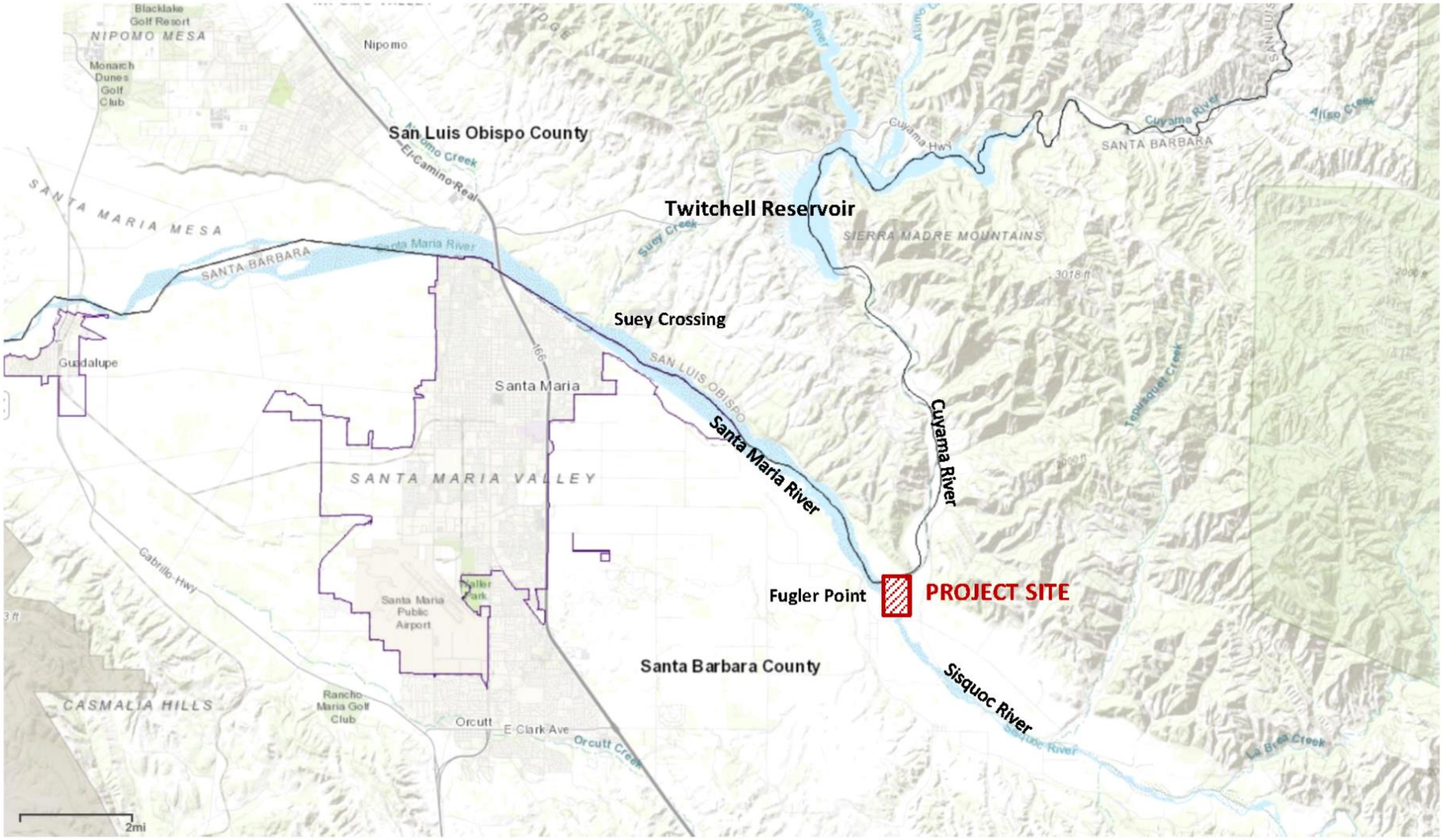
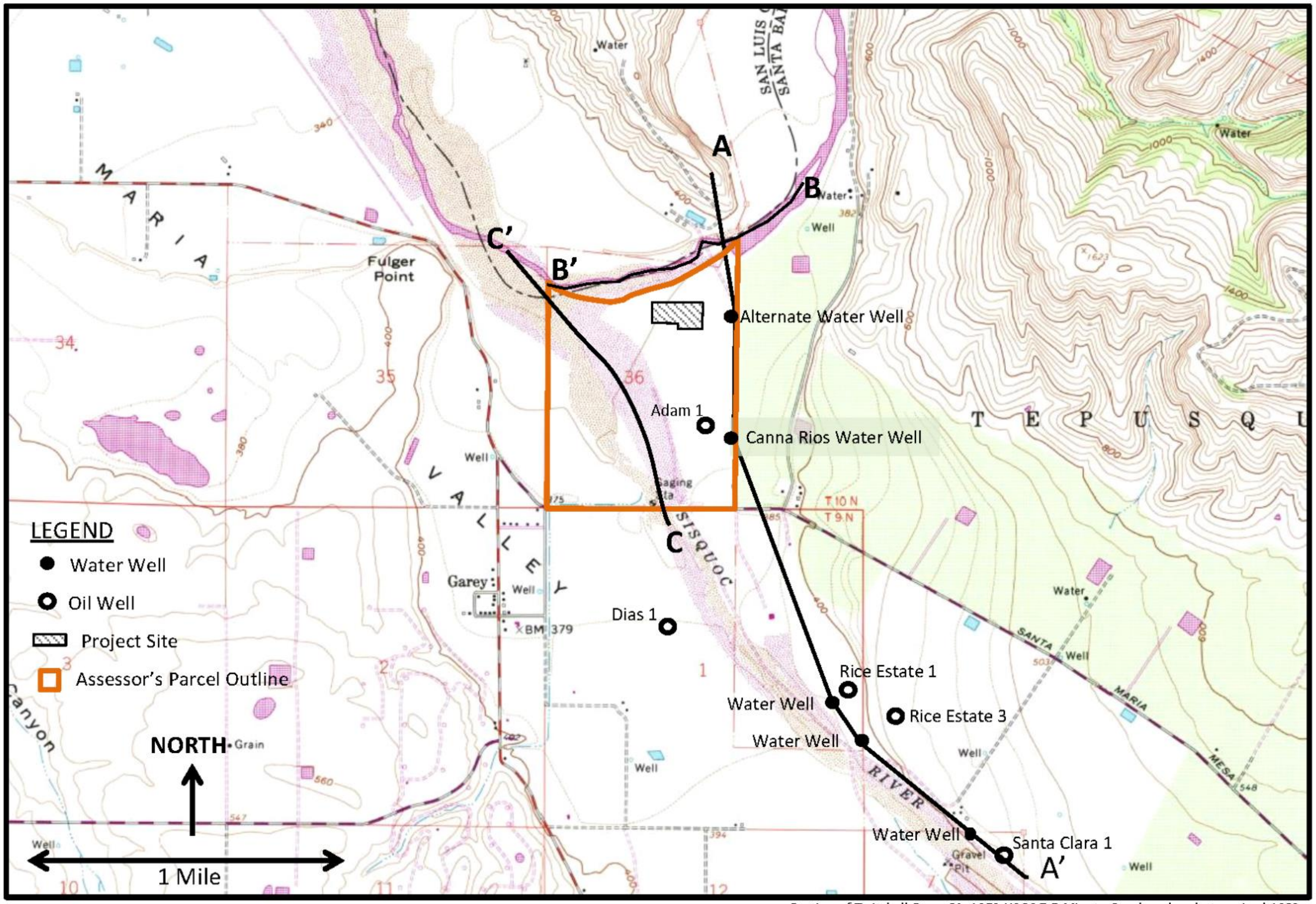


Figure 1: Site Location Map Showing Project Site



Portion of Twitchell Dam, CA, 1959 USGS 7.5-Minute Quadrangle, photorevised 1982

Figure 2: Topographic Map of Canna Rios Project area showing Project Site outline and line of cross section A-A' with the water and oil wells used in constructing the cross section, and Stream Profiles B-B' and C-C'

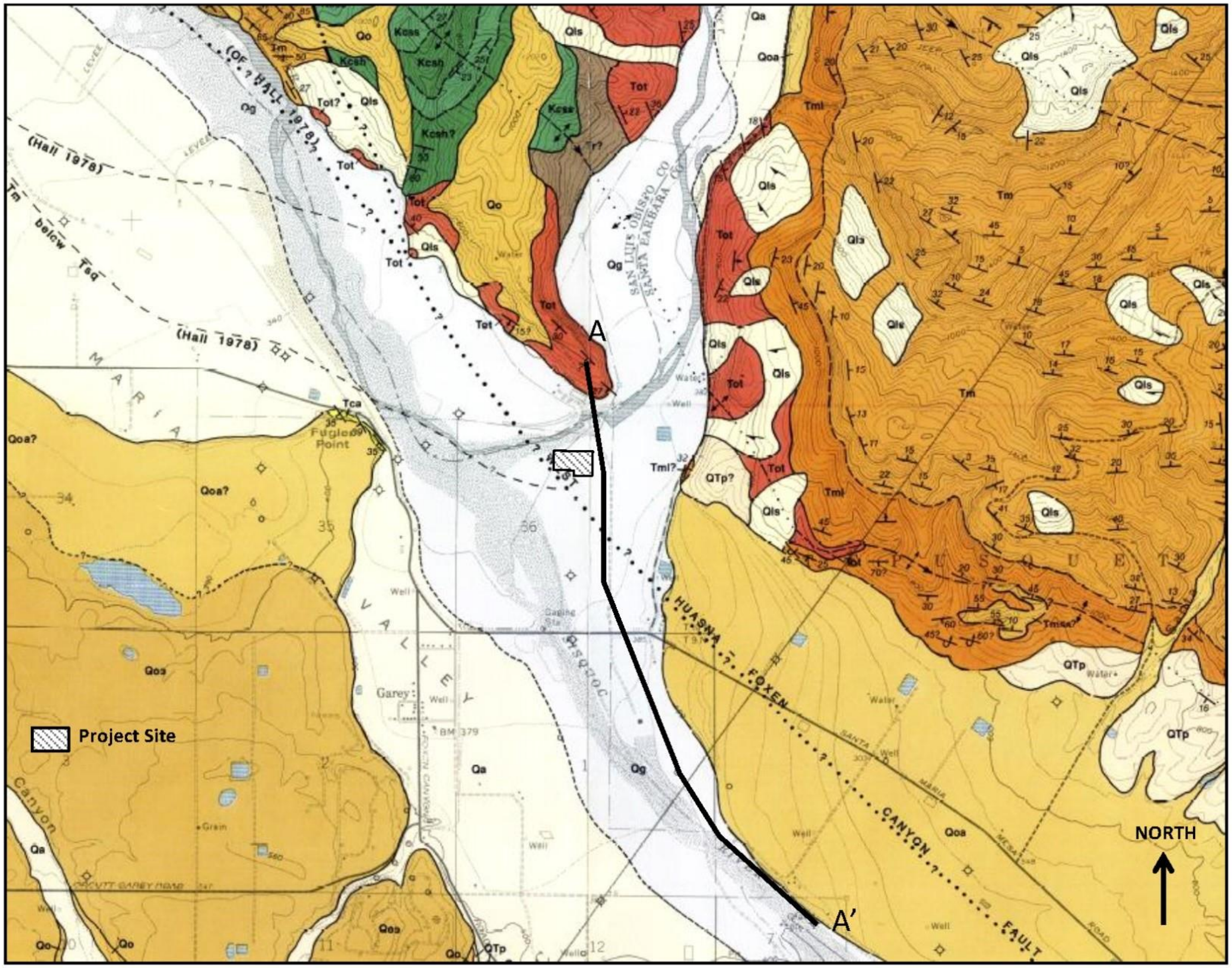


Figure 3: Geologic Map of the Canna Rios area showing the line of cross section A-A'

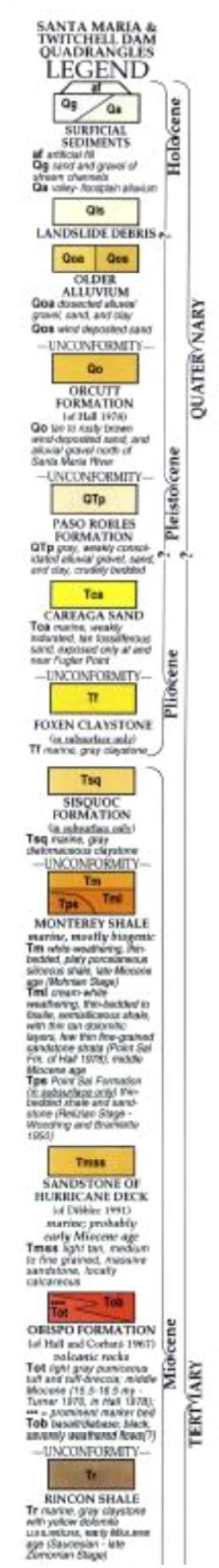


Figure 3a: Legend for Figure , Geologic Map
Of the Canna Rios area, Santa Maria, CA

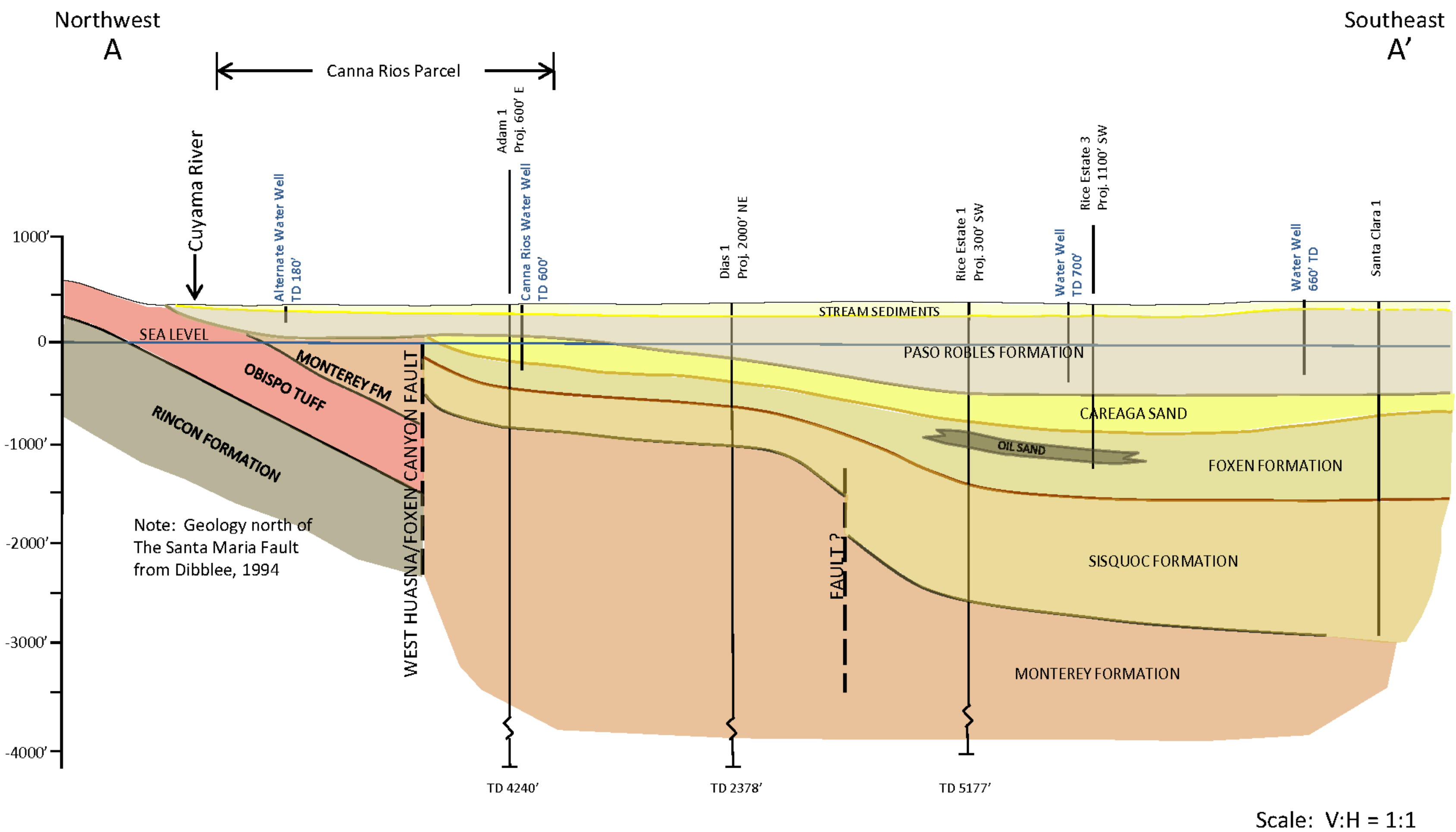


FIGURE 4: Regional Cross Section A-A' through proposed Canna Rios water well showing subsurface geology. Oil wells used for this section are noted in References. Well completion reports for the water wells are in Attachment A.

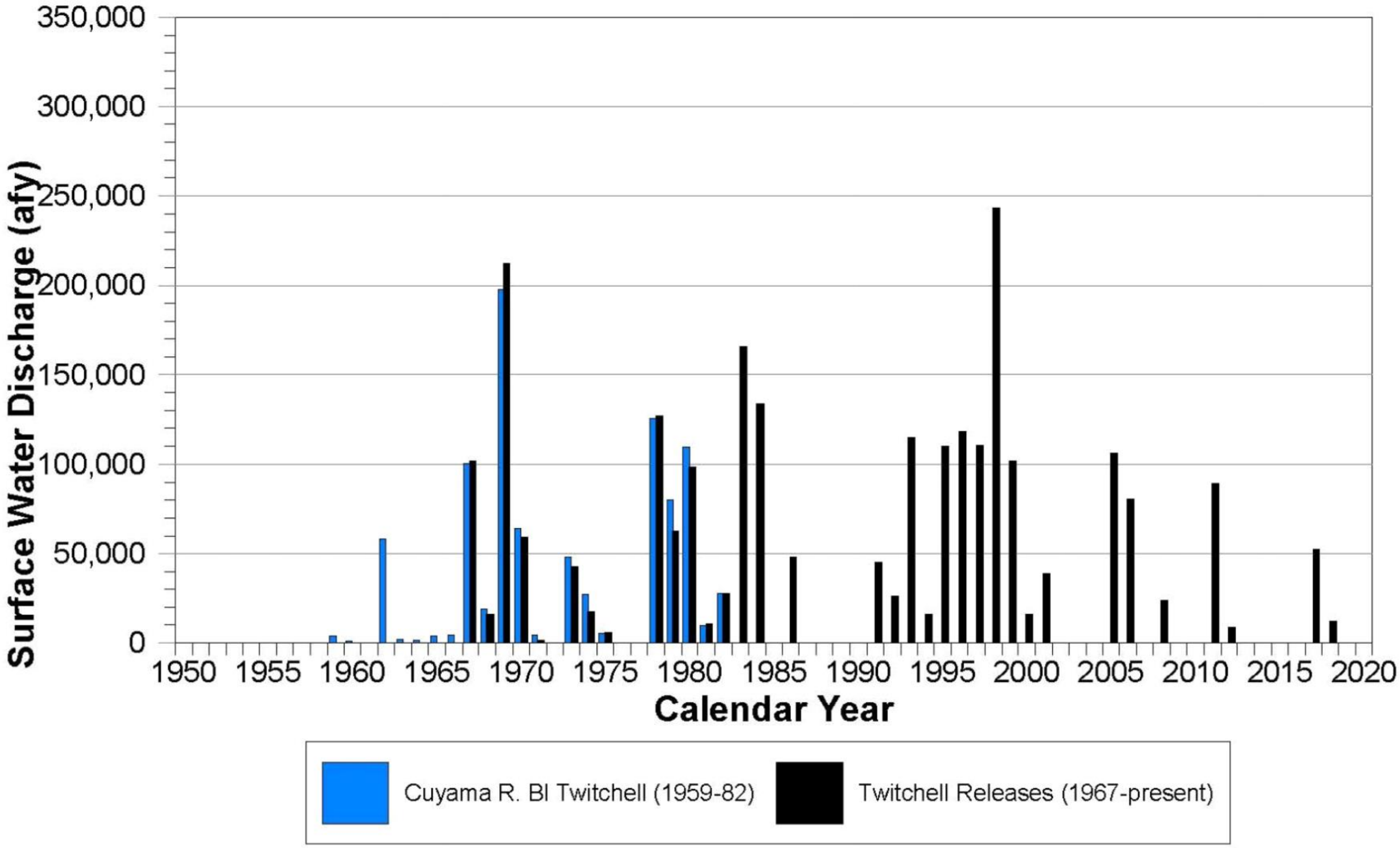


Figure 5: Historical Discharge, Cuyama River and Twitchell Reservoir Releases, Santa Maria Valley Management Area (from Luhdorff and Scalmanini, April 10, 2019, Figure 2.3-1a).

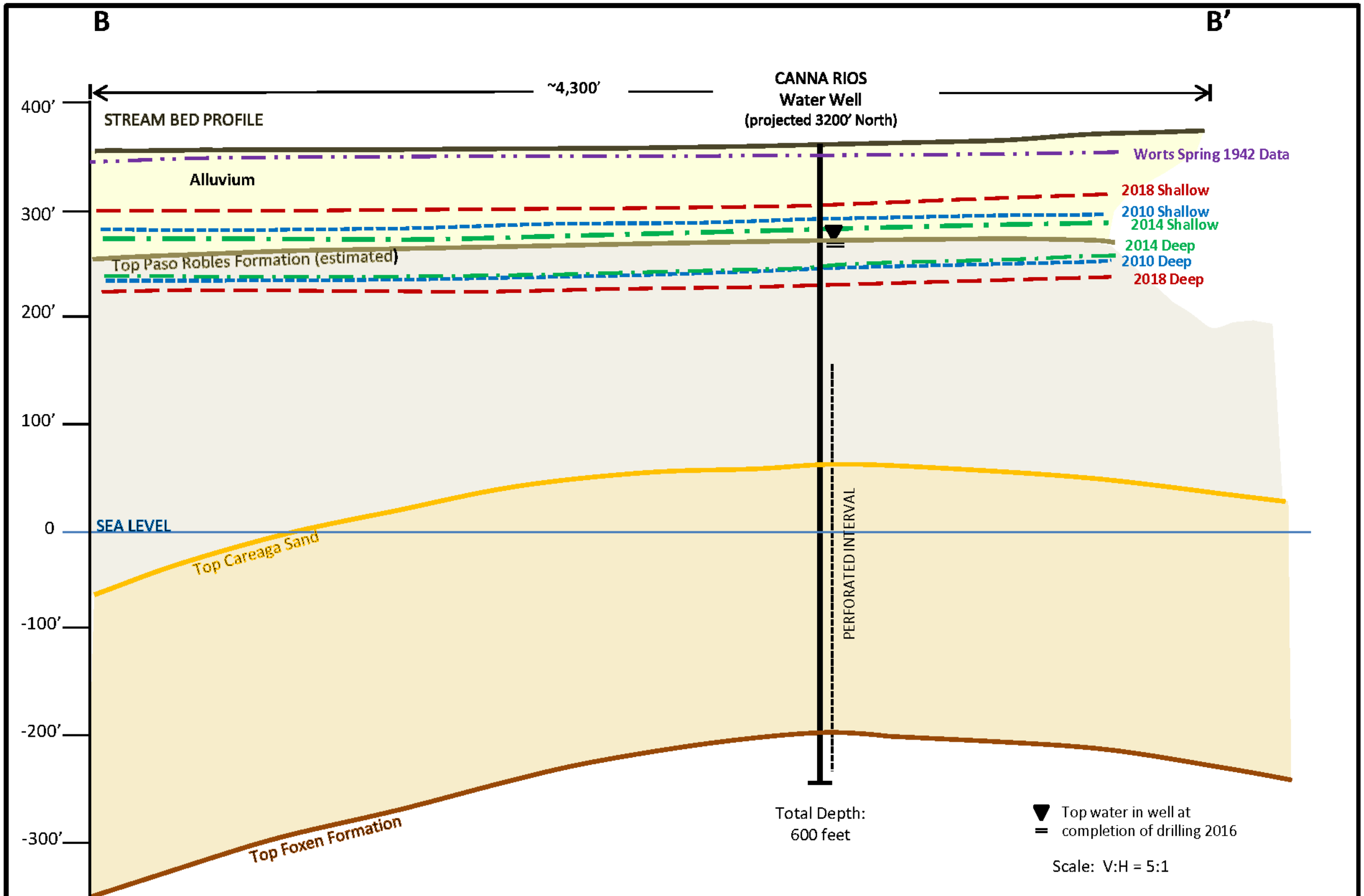


Figure 6: Stream Profile of a portion of the Cuyama River showing Canna Rios water well (projected) with groundwater elevation levels for 2010, 2014 and 2018 (from LSCE, 2019) and projected formation tops.

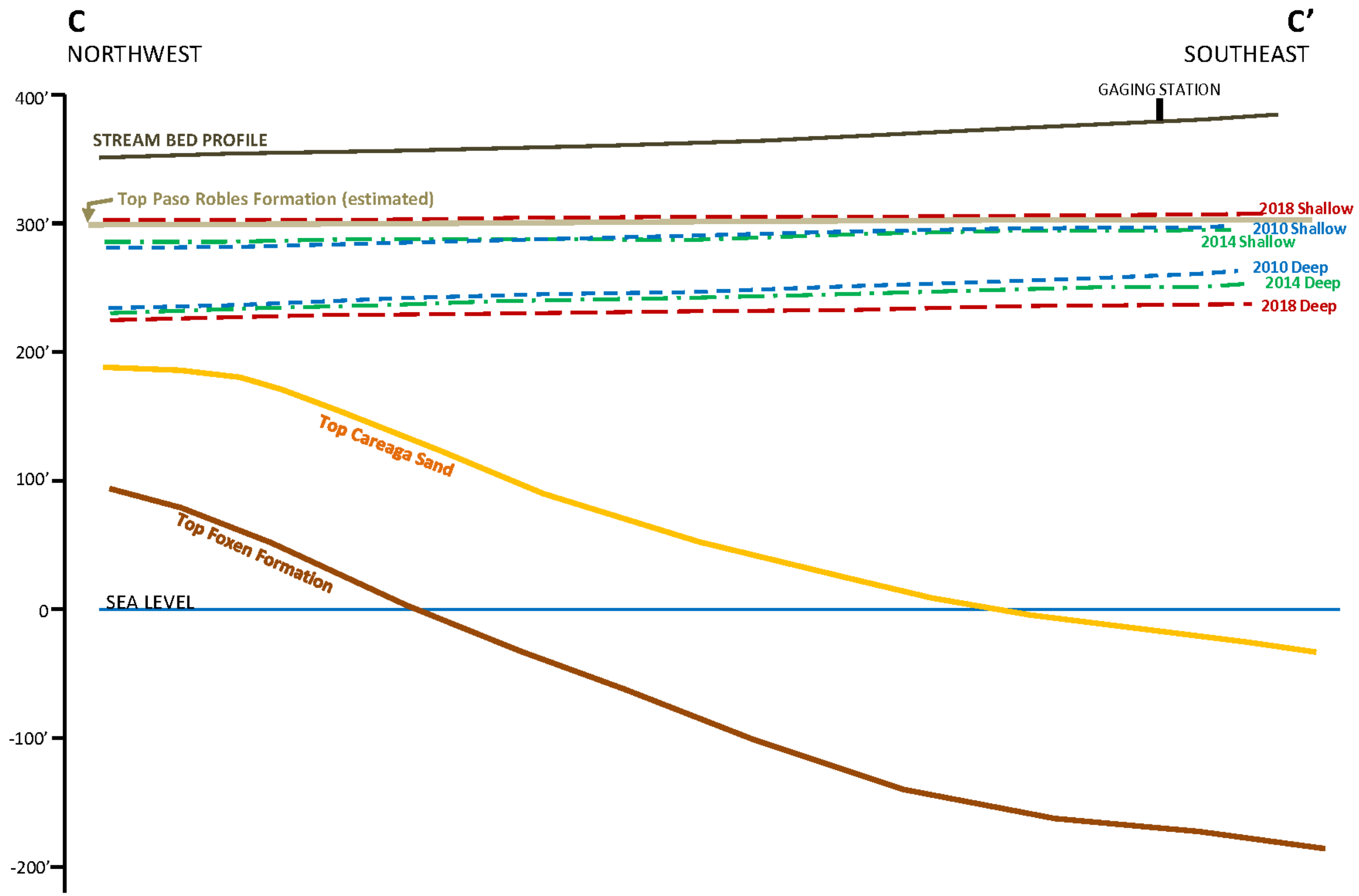


Figure 7: Stream Profile of a portion of the Sisquoc River from the Gaging Station at Santa Maria Mesa Bridge (Southeast) to the confluence with the Cuyama River (Northwest). Groundwater elevations for 2010, 2014 and 2018 are from LSCE (2019). Formation tops are estimated based on nearby oil and/or water wells.

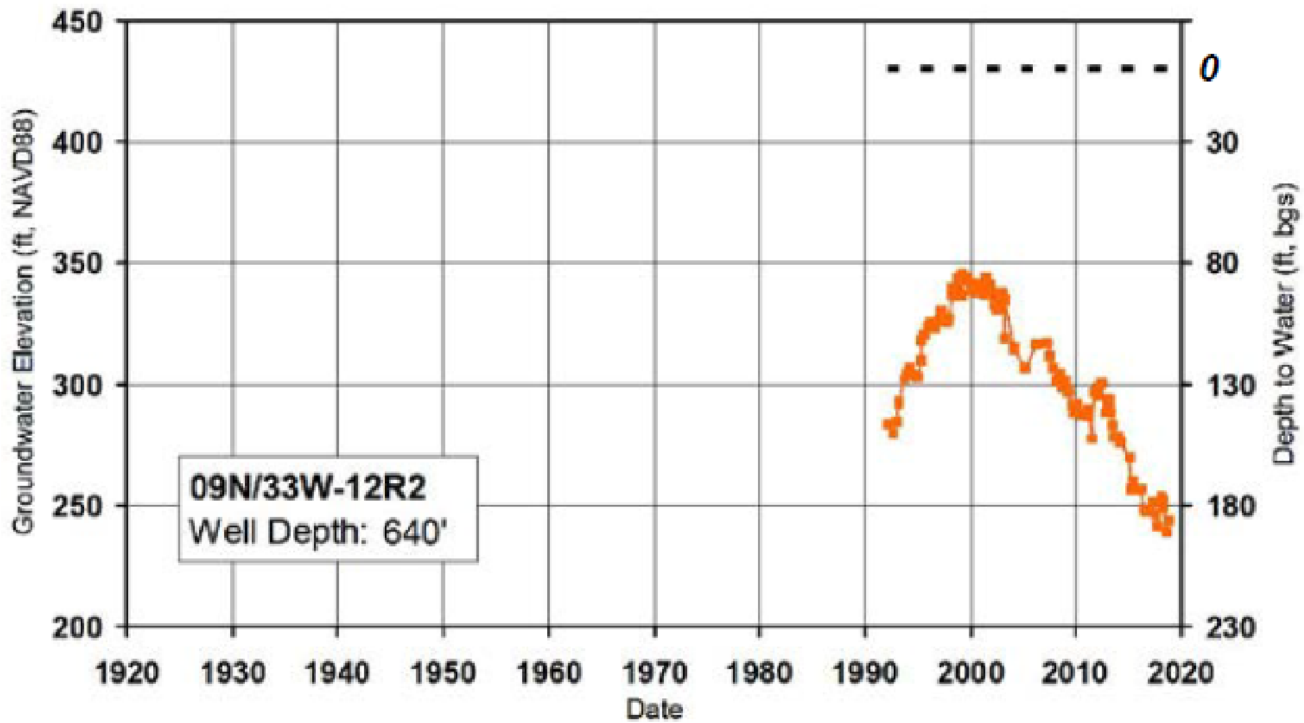


Figure 8: Hydrograph showing groundwater elevations for USGS well 09N/33W-12R2
This well is in the southeast 40 acres of Section 12 near the town of Sisquoc
(from Luhdorff and Scalmanini, 2019, Figure 2.1-2).

ATTACHMENT A

State of California

Well Completion Report

WCR Form Submitted 12/20/2016

WCR2016-008549

Owner's Well Number: Abel Maldonado — Date Work Began: 11/01/2016 — Date Work Ended: 11/28/2016

Local Permit Agency: Santa Barbara County Environmental Health Services

Secondary Permit Agency: — Permit Number: 0001567 — Permit Date: 09/19/2016

Well Owner (must remain confidential pursuant to Water Code 13752)

Name: Abel Maldonado The Maldonado Companies LLC

Mailing Address: 4665 Santa Maria Mesa Rd

City: Santa Maria — State: CA — Zip: 93454

Planned Use and Activity

Activity: New Well

Planned Use: Water Supply Irrigation - Agriculture

Well Location

Address: 4665 Santa Maria Mesa RD

City: Santa Maria — Zip: 93454 — County: Santa Barbara

Latitude: ___ Deg. ___ Min. ___ Sec. N — Longitude: ___ Deg. ___ Min. ___ Sec. W

Dec. Lat. — Dec. Long.

Vertical Datum — Horizontal Datum

Location Accuracy — Location Determination Method

APN: 129040010

Township

Range

Section

Baseline Meridian

Ground Surface Elevation

Elevation Accuracy

Elevation Determination Method

Borehole Information

Orientation: Vertical — Specify

Drilling Method: Direct Rotary — Drilling Fluid: Water

Total Depth of Boring: 600 Feet

Total Depth of Completed Well: 550 Feet

Water Level and Yield of Completed Well

Depth to first water: 89 (Feet below surface)

Depth to Static Water Level: 86 (Feet) — Date Measured: 12/05/2016

Estimated Yield*: 1100 — Test Type: Pump

Test Length: 4 — Total Drawdown: 113 (Feet)

*May not be representative of a well's long term yield.

Geologic Log - Lite

Depth from Surface Feet	to Feet	Material Type	Material Color	Material Texture	Material Description
0	57	Gravel			Fine & Coarse Sand
57	115	Gravel			Fine & Coarse Sand
115	165	Clay	Light Brown		Gravel; Fne & Coarse Sand
165	185	Gravel			Mostly Coarse Sand; Fine Sand
185	243	Gravel			Shale; Streeks of white clay; Some Lght brown Clay; Fine Sand
243	306	Clay	Light Gray		Streeks of White Clay; Fine Sand
306	350	Clay	Blue		Fine & Coarse Sand
350	456	Sand	Blue	Coarse	Fine Sand
456	548	Gravel	Blue		Light Green Small Gravel; Coarse & Fine Sand
548	600	Gravel	Gray		Black chirt; Coarse & Fine Sand

Casings

Casing #	Depth from Surface Feet	to Feet	Casing Type	Material	Casings Specifications	Wall Thickness (inches)	Outside Diameter (inches)	Screen Type	Slot Size if any (inches)	Description
1	0	50	Conductor or Fill Pipe	Mild Steel	N/A	25	38			conductor
2	0	260	Blank	Mild Steel	N/A	0.25	16.625			
2	260	540	Screen	Mild Steel	N/A	0.25	16.625	Wire Wrap	50	
2	540	550	Blank	Mild Steel	N/A	0.25	16.625			

Annular Material

Depth from Surface Feet to Feet		Fill	Fill Type Details	Filter Pack Size	Description
0	50	Cement	10.3 Sack Mix		cement seal
50	550	Other Fill	See description.	spec gravel/lapis 3	gravel poured 0'-550'

Other Observations:

Borehole Specifications

Depth from Surface Feet to Feet		Borehole Diameter (inches)
0	600	28

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name COAST DRILLING INC
Person, Firm or Corporation

P O BOX 1308 GROVER BEACH CA 93483
Address City State Zip

Signed Roberta Haylock 12/20/2016 905479
C-57 Licensed Water Well Contractor Date Signed C-57 License Number

Attachments

map for abel maldonado.pdf - Location Map

DWR Use Only

Site Number / State Well Number

N W

Latitude Deg/Min/Sec Longitude Deg/Min/Sec

TRS:

APN:

ELECTRIC - GAMMA RAY-TEMPERATURE LOG

boredata

Pilot Borehole

Phone: (888) 908-5226 Fax: (661) 505-6561 Web: www.boredata.com Email: ccorbell@boredata.com

Filing No.

COMPANY Cast Well Drilling

WELL Abel Moldonado

FIELD Santa Maria

STATE California COUNTY Santa Barbara

LOCATION:
Santa Maria Mesa Rd. See GPS coordinates

OTHER SERVICES:

Job No. 2230

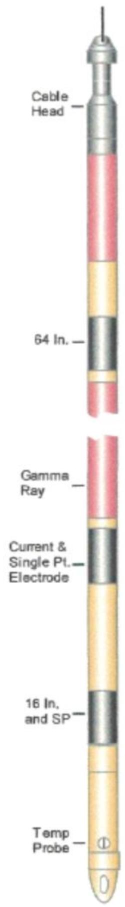
SEC: ____ TWP: ____ RGE: ____ LAT.: 34.89636 LONG.: -120.30206

Permanent Datum: Ground Level Elev.: ____ Ft. Elevs.: K.B. ____ Ft.
Log Measured From: Ground Level, 0 Ft. Above Perm. Datum D.F. ____ Ft.
Drilling Measured From: Ground Level G.L. ____ Ft.

Run	One			
Date	Nov 08, 2016			
Depth-Driller	600 Ft	Ft	Ft	Ft
Depth-Logger	600 Ft	Ft	Ft	Ft
Top Logged Interval	7 Ft	Ft	Ft	Ft
Btm Logged Interval	600 Ft	Ft	Ft	Ft
Casing-Driller	N/A In @ Ft	In @ Ft	In @ Ft	In @ Ft
Casing - Logger In@Ft	In @ Ft	In @ Ft	In @ Ft	In @ Ft
Bit Size	In @ Ft	In @ Ft	In @ Ft	In @ Ft
Time On Bottom	10:30			
Type Fluid in Hole	Bentonite			
Density / Viscosity				
pH / Fluid Loss	ml	ml	ml	ml
Source of Sample	Circ			
Rm @ Mea. Temp	7 @ 75 °F	@ °F	@ °F	@ °F
Rmf @ Mea. Temp	7 @ 75 °F	@ °F	@ °F	@ °F
Rmc @ Mea. Temp	@ °F	@ °F	@ °F	@ °F
Source Rmf / Rmc	Meas			
Rm @ BHT	@ °F	@ °F	@ °F	@ °F
Time Since Circ.	3 Hr	Hr	Hr	Hr
Max. Rec. Temp.	72.8 °F	°F	°F	°F
Van No. / Location	BD-1 / Bfld			
Recorded By	Craig Corbell			
Witnessed By	Roberta Haylock			

This Eagle Plot Heading Conforms To API RP 31A

ELECTRIC - GAMMA RAY-TEMPERATURE LOG TOOL



SPONTANEOUS POTENTIAL LOGS:

SP Logs record potentials or voltages developed between the borehole fluid and the surrounding formation and are representations of lithology and water quality. Recording of SP logs are limited to water-filled or mud-filled open holes.

NORMAL RESISTIVITY LOGS:

Normal Resistivity Logs record the electrical resistivity of the borehole environment with lower resistivities indicative of clays and higher resistivities being sands and gravels. Normal resistivity logs are affected by bed thickness, Borehole diameter and borehole fluid.

SINGLE POINT RESISTIVITY LOGS:

Single Point Resistivity Logs record the electrical resistance from points within the borehole to an electrical ground at land surface. Single-point resistance logs are useful in the determination of lithology, water quality, and location of fracture zones.

GAMMA RAY LOGS:

Gamma Ray Logs record the amount of natural gamma radiation emitted by the rocks surrounding the borehole. The most significant naturally occurring sources of gamma radiation are potassium 40 and daughter products of the uranium and thorium decay series. Clay and shale bearing rocks commonly emit relatively high gamma radiation because they include weathering products of potassium feldspar and mica and tend to concentrate uranium and thorium by ion absorption and exchange.

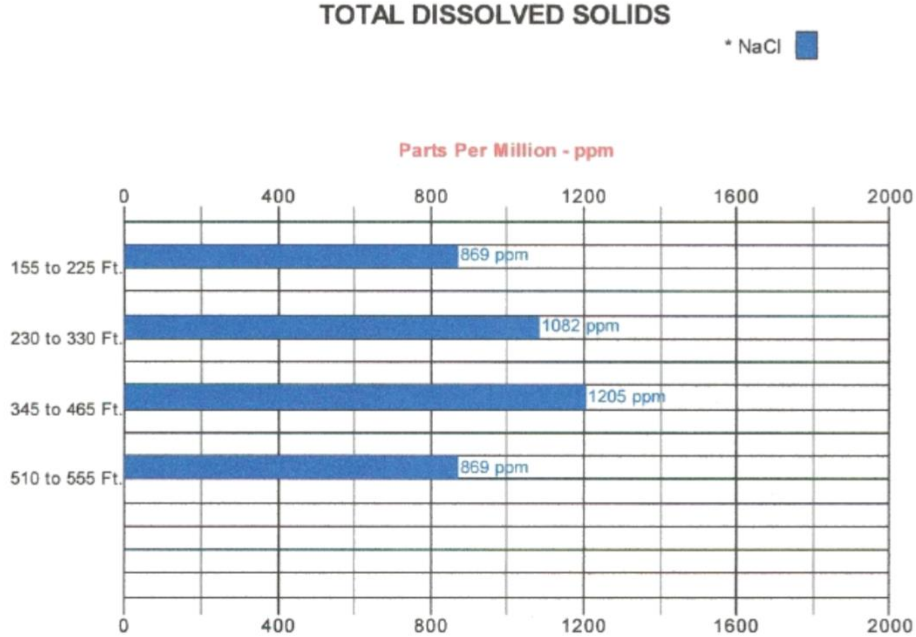
TEMPERATURE LOGS:

Temperature Logs record the water temperature in the borehole. Temperature logs are useful for delineating water-bearing zones and identifying vertical flow in the borehole between zones of differing hydraulic head penetrated by wells. Borehole flow between zones is indicated by temperature gradients that are less than the regional geothermal gradient.

ELECTRIC LOG SPECIFICATIONS:

Diameter	1.73 Inches
Length	8.37 Feet
Weight	21.7 Lbs.
Max. Temp	158° F
Resist. Range	0 - 10,000 ohm-m
Gamma Ray	1.97 inches long x.98 inches diameter Scintillation crystal

TOTAL DISSOLVED SOLIDS



TDS Classes

Class 1: Excellent to Good – Less than 700 ppm
Class 2: Good to Injurious – 700 to 2000 ppm
Class 3: Injurious to Poor – More than 2000 ppm

NaCl = Sodium Chloride

METHODOLOGY TO CALCULATE TDS FROM THE SP CURVE

Obtain freshly circulated mud and use a mud press to measure R_{mf}.:

Obtain SSP from SP to make these calculations:

1. R_{mf}^{Corr} = [R_{mf} @ meas temp x (Temp +6.77) / 81.770]
2. R_{we} = R_{mf}^{Corr} / $10^{(ssp/-70.7)}$
3. R_w(NaCL) = ($R_{we}^{1.227}$) x .0825
4. R_w($NaHCO^3$) = R_w x (NaCl / 0.85)

Solving for Electrical Conductivity (EC):

5. NaCl in MilliSiemens/cm^3 =10,000 / R_w(NaCL)
6. $NaHCO^3$ in MilliSiemens/cm^3 = 10,000 / R_w($NaHCO^3$)

Solving for Total Dissolved Solids (TDS):

7. NaCl in ppm = 5300 / R_w(NaCL)
8. $NaHCO^3$ in ppm = 10000 / R_w(NaCL)

REFERENCES:

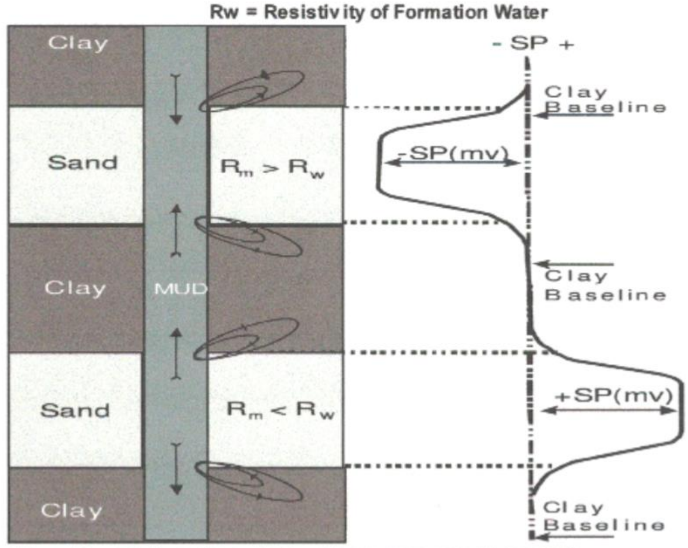
WWW.EPA.GOV?OGWDW/UIC/PDFS/HISTORICAL/STUDY_UIC_METHODS_TDS_CONC_1988.PDF

WWW.WELLLOG.COM/TDS.HTM

THE DEVELOPMENT OF THE SP CURVE

Rm = Resistivity of Mud

Rw = Resistivity of Formation Water



The Liquid Junction Potential is important for SP development. This type of potential develops when two electrolytes of different concentrations containing ions of different mobilities come in contact with each other. The Electric Log Tool is designed to measure that potential displayed as the SP Curve.

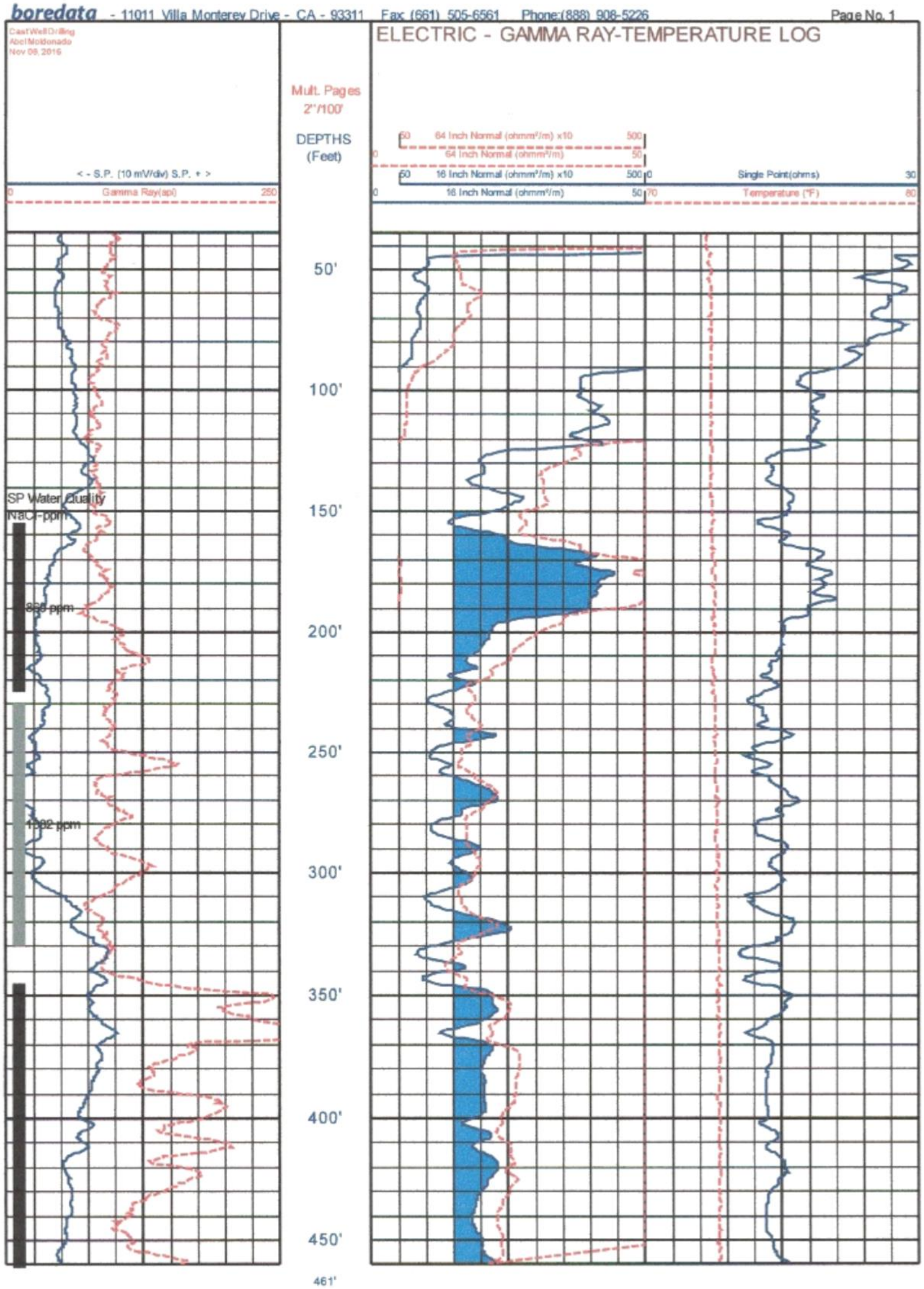
NOTICE

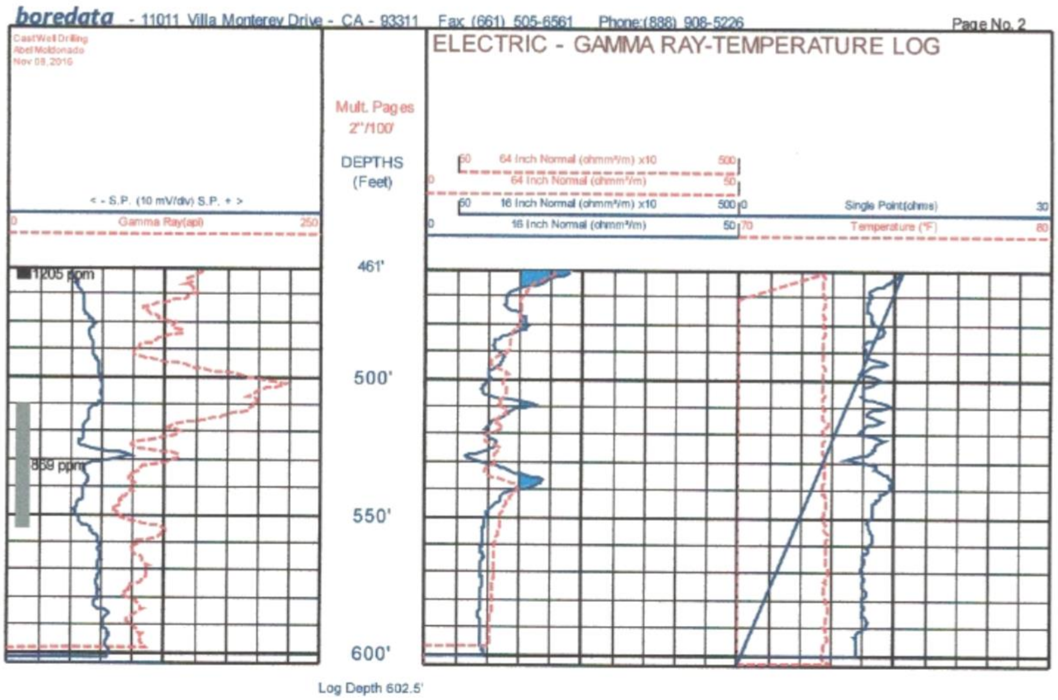
All interpretations are opinions based on inferences from electrical and other measurements and we do not guarantee the accuracy or correctness of any verbal or written interpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by one of our officers, agents or employees. These interpretations are also subject to our General Terms and Conditions as set out in our current Price Schedule.

REMARKS

boredata - 11011 Villa Monterey Drive - CA - 93311 Fax (661) 505-6561 Phone:(888) 908-5226

ELECTRIC - GAMMA RAY-TEMPERATURE LOG




boredata - 11011 Villa Monterey Drive - CA - 93311 Fax (661) 505-6561 Phone:(888) 908-5226
Page No. 2
CastWell Drilling
Abel Moldonado
Nov 08, 2016
ELECTRIC - GAMMA RAY-TEMPERATURE LOG
Mult. Pages
2"/100'
DEPTHS
(Feet)
< - S.P. (10 mV/div) S.P. + >
0 Gamma Ray(api) 250
60 64 Inch Normal (ohmm²/m) x10 500
0 64 Inch Normal (ohmm²/m) 50
60 16 Inch Normal (ohmm²/m) x10 500
0 16 Inch Normal (ohmm²/m) 50
0 Single Point(ohms) 30
70 Temperature (°F) 80
1205 ppm
869 ppm
461'
500'
550'
600'
Log Depth 602.5'

FIGURES

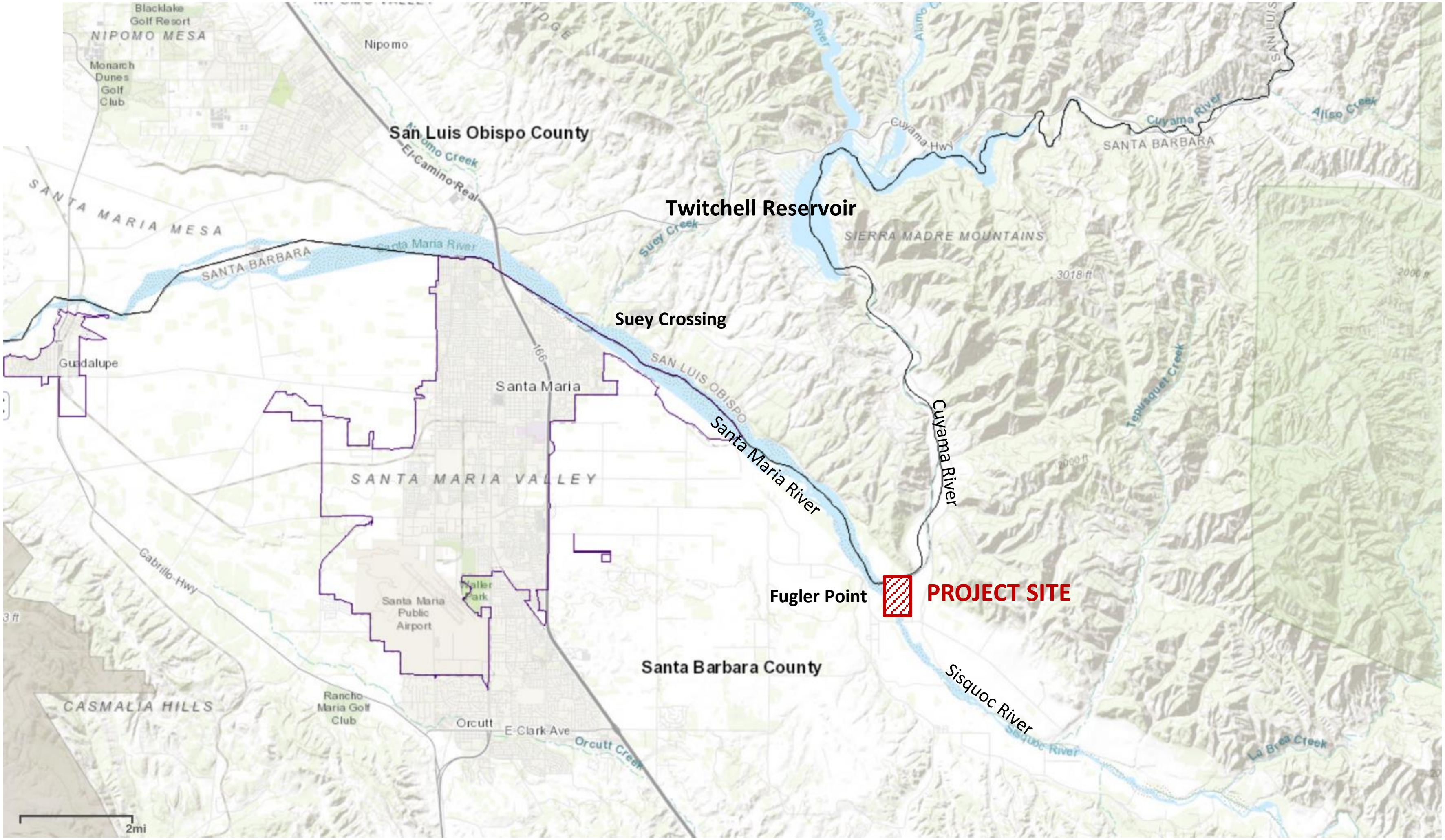
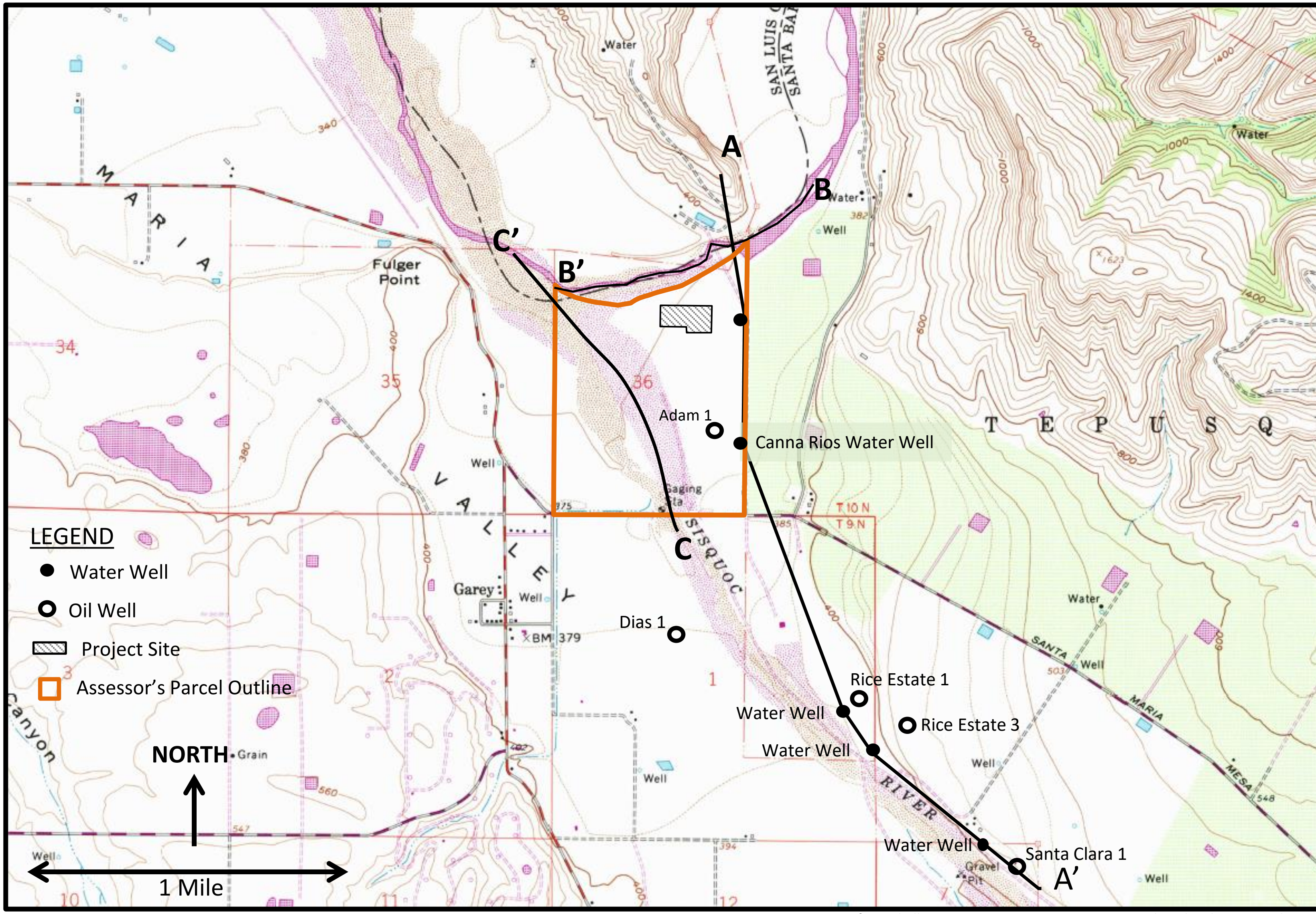
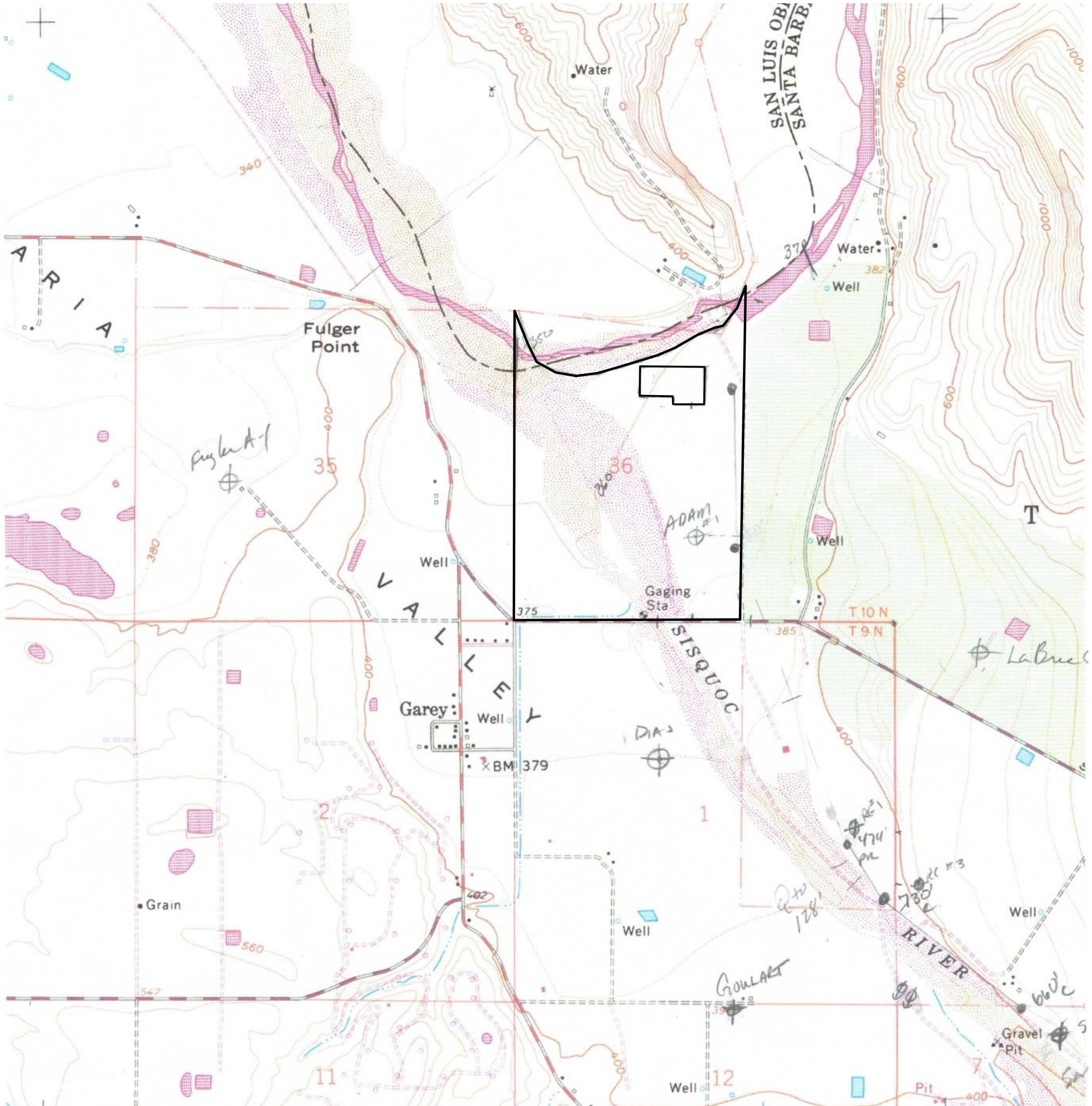


Figure 1: Site Location Map Showing Project Site

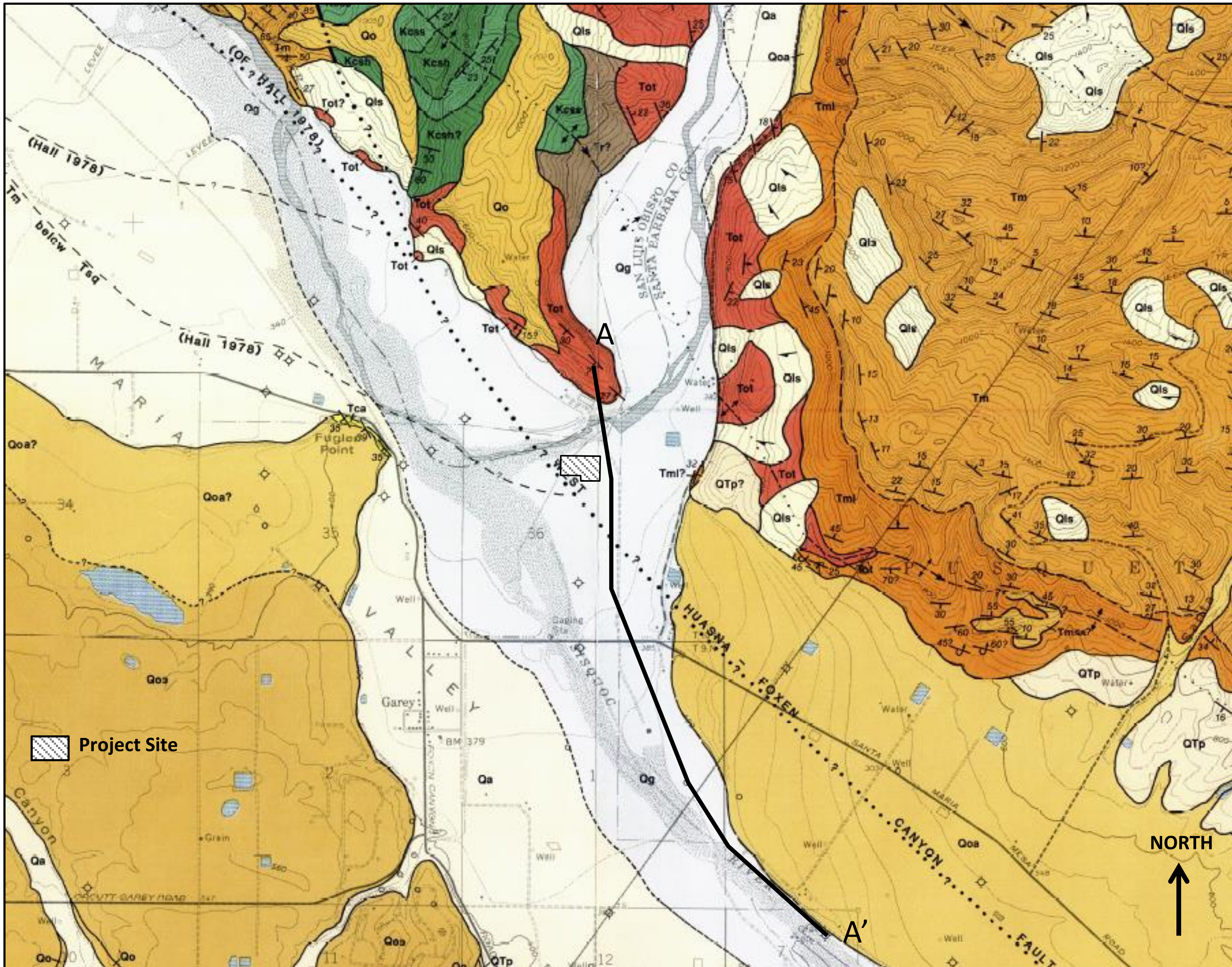


Portion of Twitchell Dam, CA, 1959 USGS 7.5-Minute Quadrangle, photorevised 1982

Figure 2: Topographic Map of Canna Rios Project area showing Project Site outline and line of cross section A-A' with the water and oil wells used in constructing the cross section, and Stream Profiles B-B' and C-C'

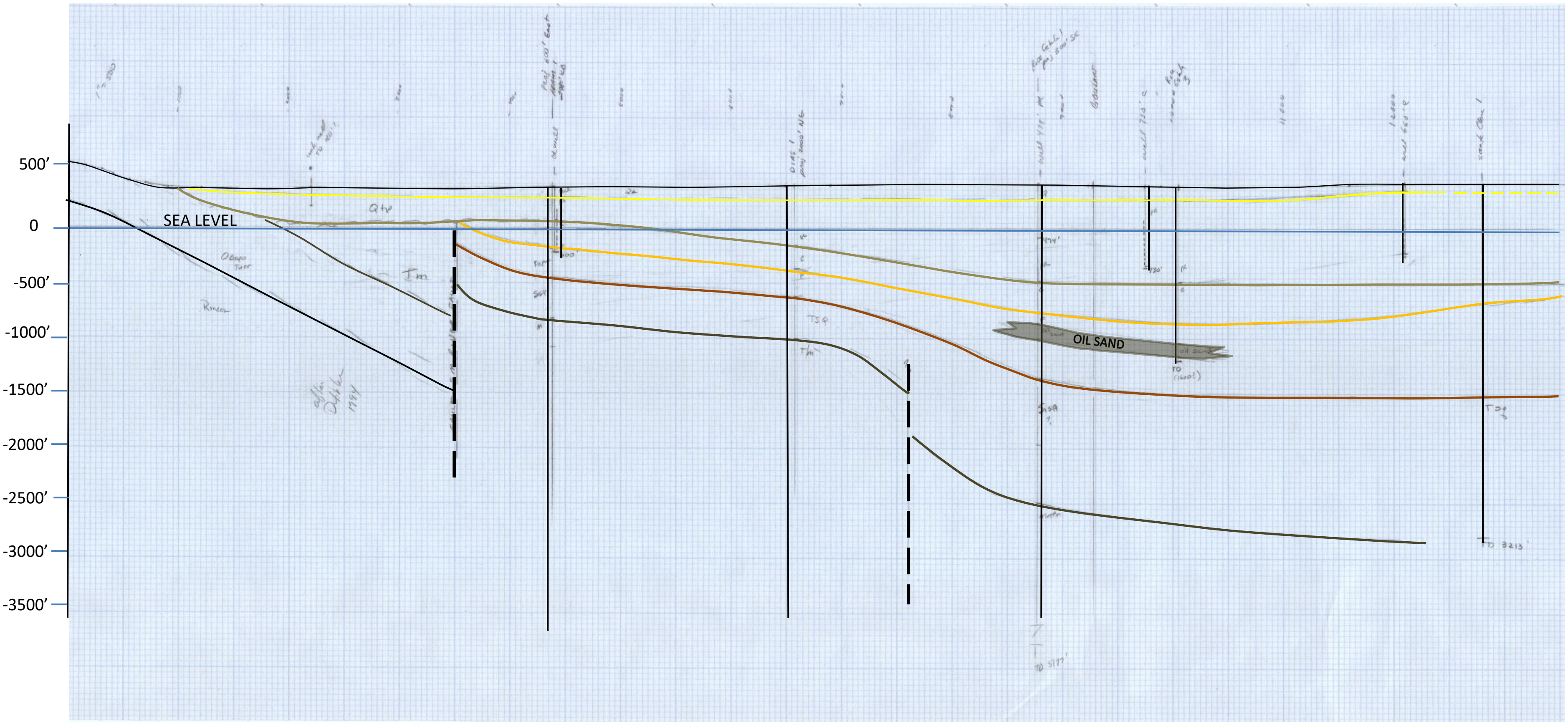


SAN LUIS OBI
SANTA BARBA
Water
Water
Well
Fulger Point
35
36
ADAM #1
Well
Gaging Sta
375
385
T 10 N
T 9 N
VALLEY
SISQUOC
RIVER
Garey
Well
BM 379
2
1
Grain
Well
GOULART
Well
Gravel Pit
11
12
Well
Pit
7
T
340
400
380
600
1000
560
547
402



Map from Dibblee, 1994

Figure 3: Geologic Map of the Canna Rios area showing the line of cross section A-A'


500'
0
-500'
-1000'
-1500'
-2000'
-2500'
-3000'
-3500'
SEA LEVEL
OIL SAND

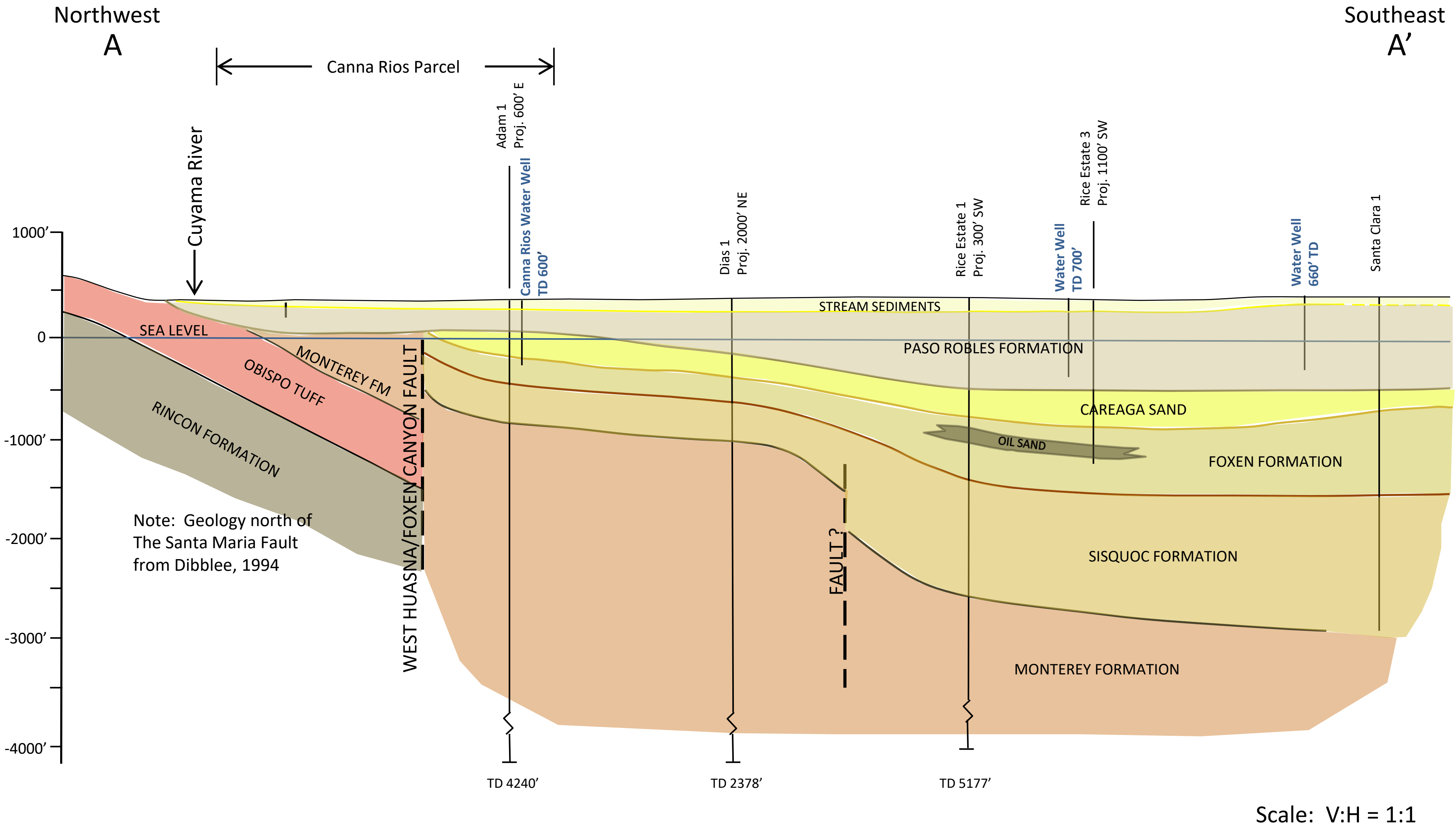


FIGURE 4: Regional Cross Section A-A' through proposed Canna Rios water well showing subsurface geology. Oil wells used for this section are noted in References. Well completion reports for the water wells are in Attachment A.

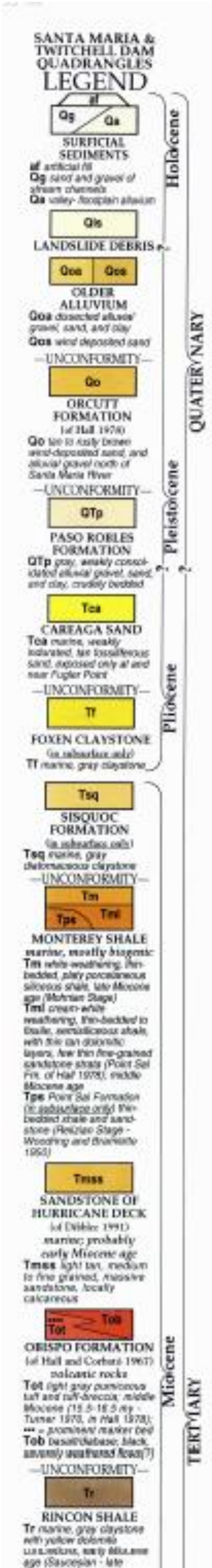


Figure 3a: Legend for Figure , Geologic Map
Of the Canna Rios area, Santa Maria, CA

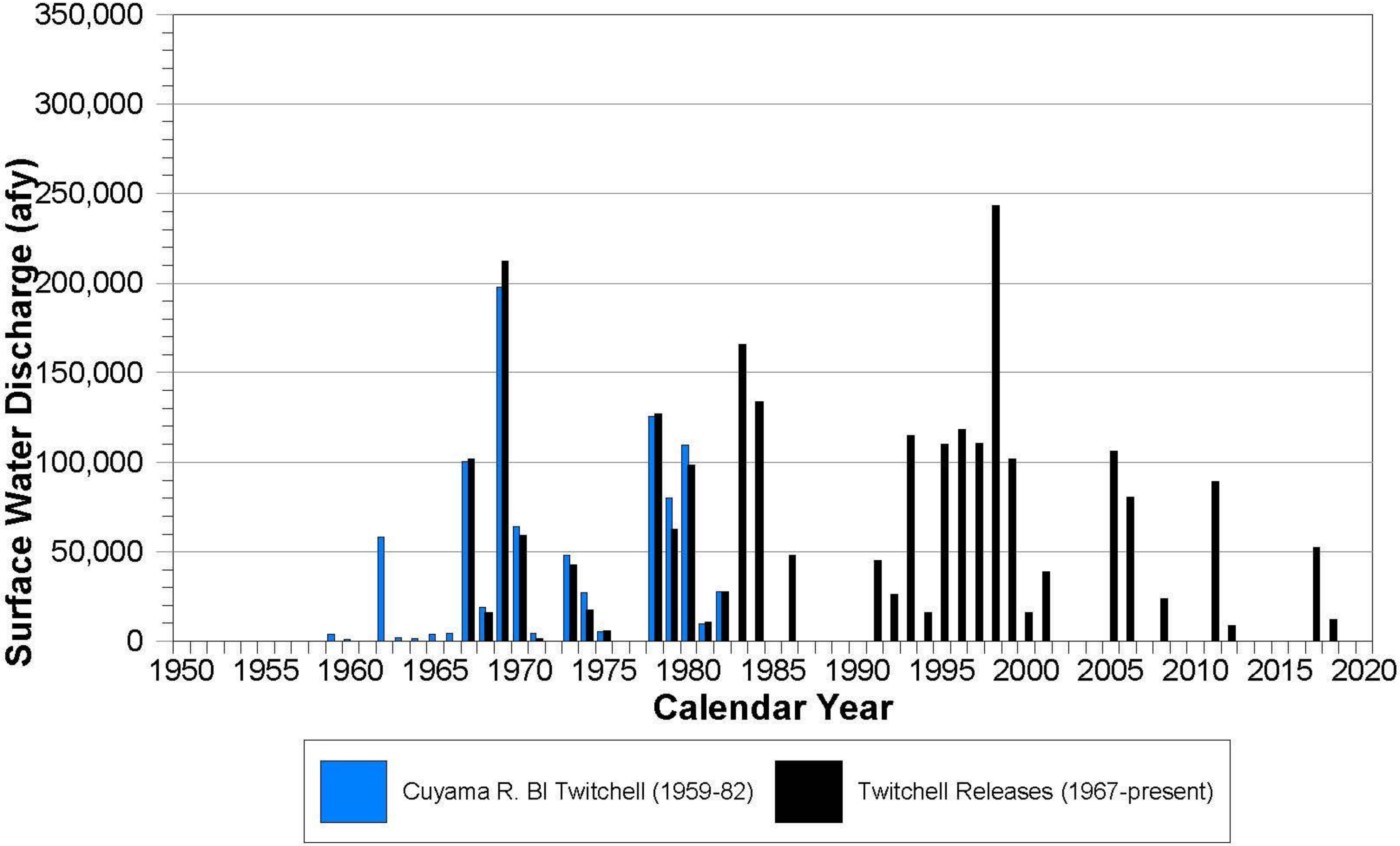


Figure 5: Historical Discharge, Cuyama River and Twitchell Reservoir Releases, Santa Maria Valley Management Area (from Luhdorff and Scalmanini, April 10, 2019, Figure 2.3-1a).

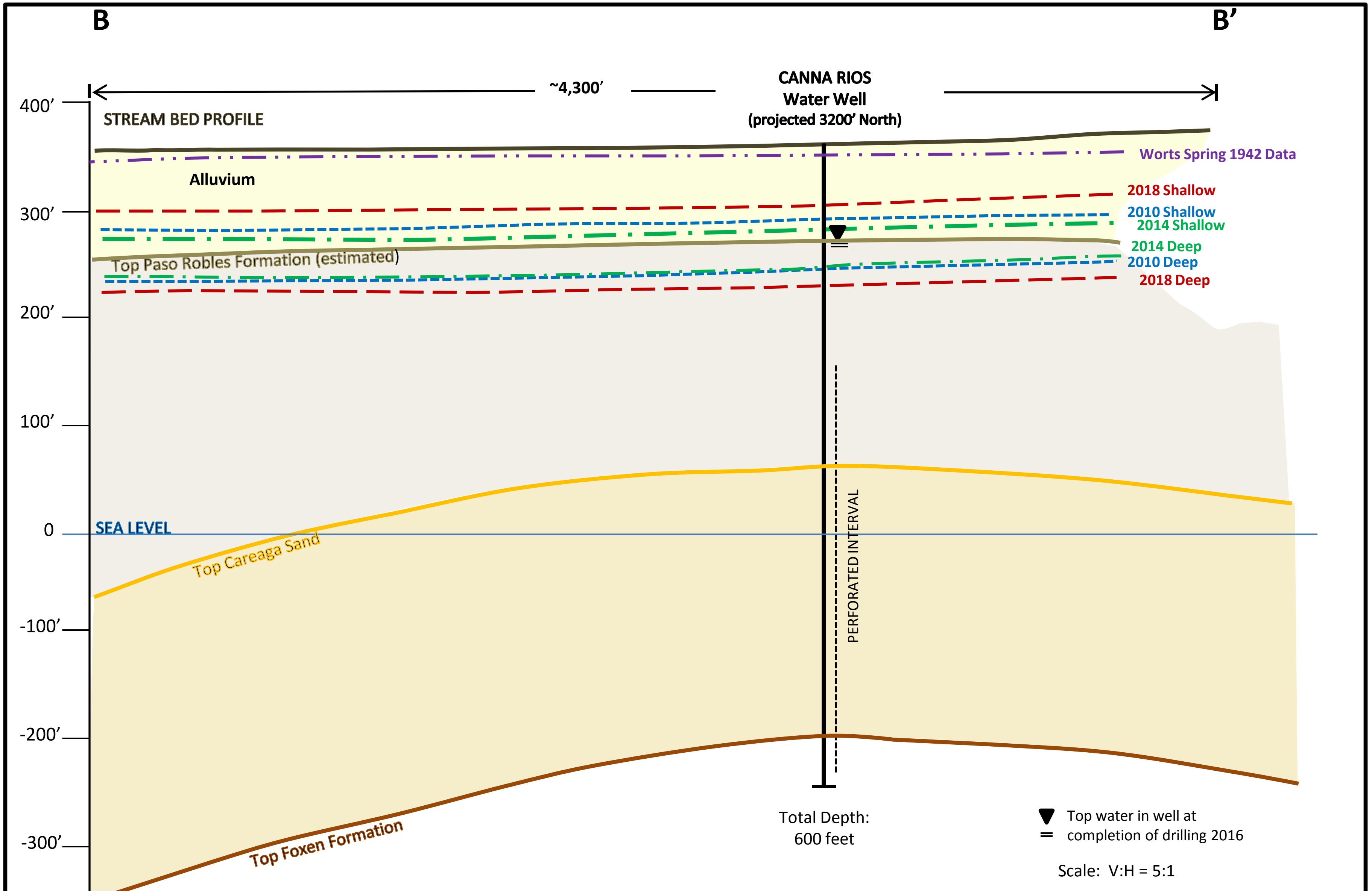


Figure 6: Stream Profile of a portion of the Cuyama River showing Canna Rios water well (projected) with groundwater elevation levels for 2010, 2014 and 2018 (from LSCE, 2019) and projected formation tops.

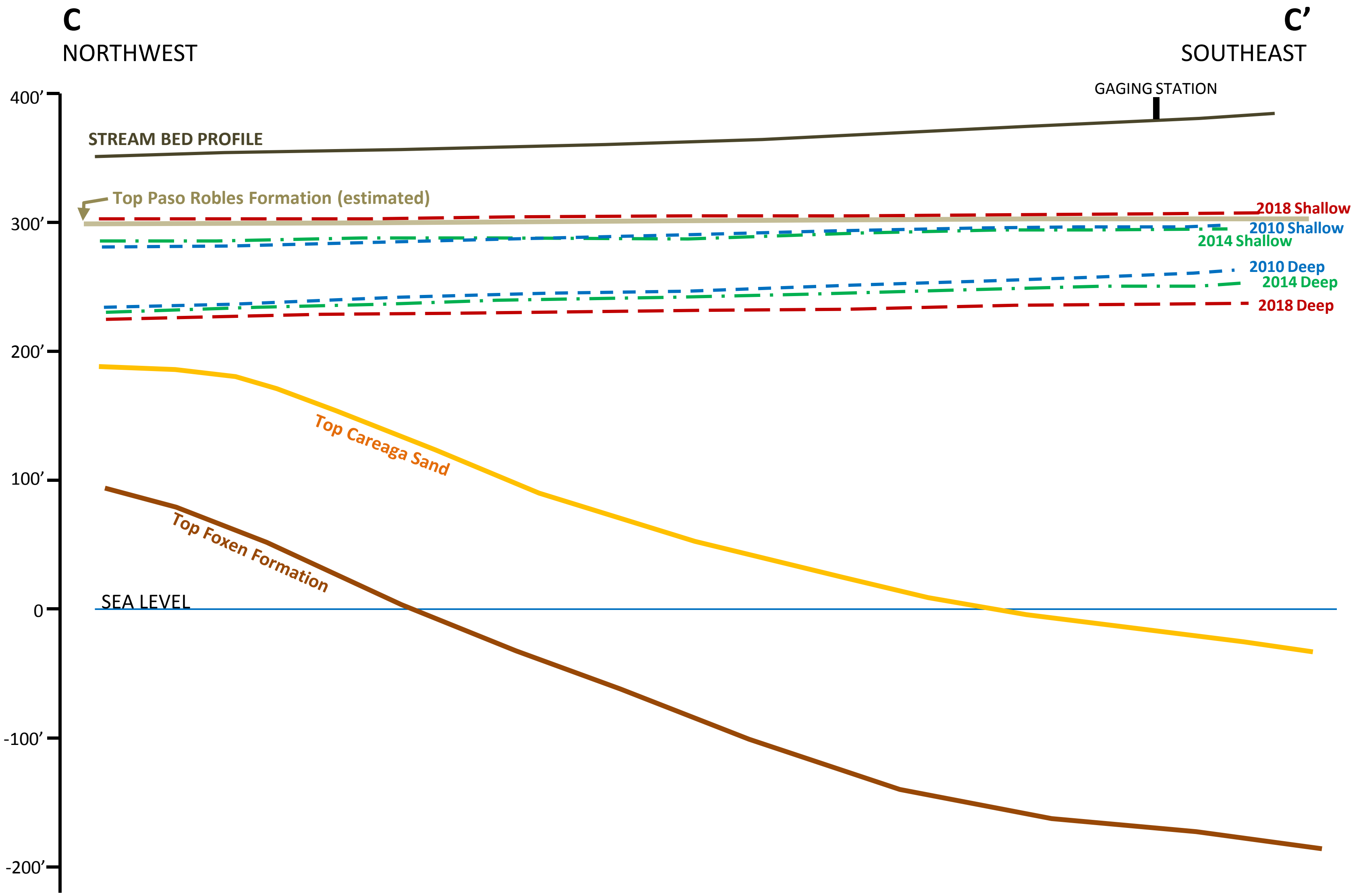


Figure 7: Stream Profile of a portion of the Sisquoc River from the Gaging Station at Santa Maria Mesa Bridge (Southeast) to the confluence with the Cuyama River (Northwest). Groundwater elevations for 2010, 2014 and 2018 are from LSCE (2019). Formation tops are estimated based on nearby oil and/or water wells.

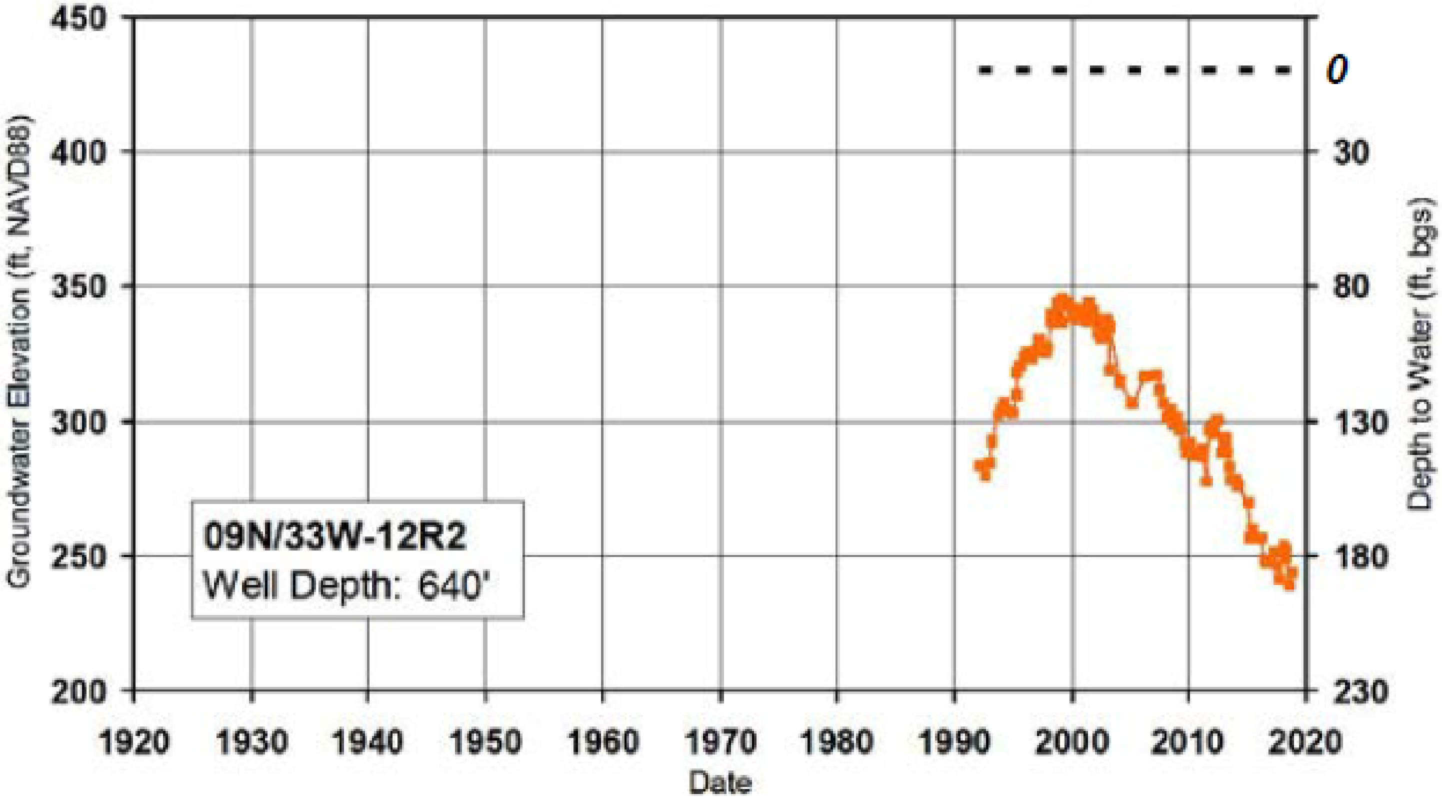


Figure 8: Hydrograph showing groundwater elevations for USGS well 09N/33W-12R2
This well is in the southeast 40 acres of Section 12 near the town of Sisquoc
(from Luhdorff and Scalmanini, 2019, Figure 2.1-2).

ATTACHMENT A

State of California

Well Completion Report

WCR Form Submitted 12/20/2016

WCR2016-008549

Owner's Well Number: Abel Maldonado | Date Work Began: 11/01/2016 | Date Work Ended: 11/28/2016

Local Permit Agency: Santa Barbara County Environmental Health Services

Secondary Permit Agency: | Permit Number: 0001567 | Permit Date: 09/19/2016

Well Owner (must remain confidential pursuant to Water Code 13752)

Name: Abel Maldonado The Maldonado Companies LLC

Mailing Address: 4665 Santa Maria Mesa Rd

City: Santa Maria | State: CA | Zip: 93454

Planned Use and Activity

Activity: New Well

Planned Use: Water Supply Irrigation - Agriculture

Well Location

Address: 4665 Santa Maria Mesa RD

City: Santa Maria | Zip: 93454 | County: Santa Barbara

Latitude: ___ Deg. ___ Min. ___ Sec. N | Longitude: ___ Deg. ___ Min. ___ Sec. W

Dec. Lat. | Dec. Long.

Vertical Datum | Horizontal Datum

Location Accuracy | Location Determination Method

APN: 129040010

Township

Range

Section

Baseline Meridian

Ground Surface Elevation

Elevation Accuracy

Elevation Determination Method

Borehole Information

Orientation: Vertical | Specify:

Drilling Method: Direct Rotary | Drilling Fluid: Water

Total Depth of Boring: 600 Feet

Total Depth of Completed Well: 550 Feet

Water Level and Yield of Completed Wall

Depth to first water: 89 (Feet below surface)

Depth to Static Water Level: 86 (Feet) | Date Measured: 12/05/2016

Estimated Yield*: 1100 | Test Type: Pump

Test Length: 4 | Total Drawdown: 113 (Feet)

*May not be representative of a well's long term yield.

Geologic Log - Lite

Depth from Surface Feet to	Feet	Material Type	Material Color	Material Texture	Material Description
0	57	Gravel			Fine & Coarse Sand
57	115	Gravel			Fine & Coarse Sand
115	165	Clay	Light Brown		Gravel; Fne & Coarse Sand
165	185	Gravel			Mostly Coarse Sand; Fine Sand
185	243	Gravel			Shale; Streeks of white clay; Some Lght brown Clay; Fine Sand
243	306	Clay	Light Gray		Streeks of White Clay; Fine Sand
306	350	Clay	Blue		Fine & Coarse Sand
350	456	Sand	Blue	Coarse	Fine Sand
456	548	Gravel	Blue		Light Green Small Gravel; Coarse & Fine Sand
548	600	Gravel	Gray		Black chirt; Coarse & Fine Sand

Casings

Casing #	Depth from Surface Feet to	Feet	Casing Type	Material	Casings Specifications	Wall Thickness (inches)	Outside Diameter (inches)	Screen Type	Slot Size if any (inches)	Description
1	0	50	Conductor or Fill Pipe	Mild Steel	N/A	25	38			conductor
2	0	260	Blank	Mild Steel	N/A	0.25	16.625			
2	260	540	Screen	Mild Steel	N/A	0.25	16.625	Wire Wrap	50	
2	540	550	Blank	Mild Steel	N/A	0.25	16.625			

Annular Material

Depth from Surface Feet	to Feet	Fill	Fill Type Details	Filter Pack Size	Description
0	50	Cement	10.3 Sack Mix		cement seal
50	550	Other Fill	See description.	spec gravel/lapis 3	gravel poured 0'-550'

Other Observations:

Borehole Specifications

Depth from Surface Feet	to Feet	Borehole Diameter (inches)
0	600	28

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name: COAST DRILLING INC
Person, Firm or Corporation

P O BOX 1308	GROVER BEACH	CA	93483
Address	City	State	Zip

Signed: [signature] — C-57 Licensed Water Well Contractor
Date Signed: 12/20/2016
C-57 License Number: 905479

Attachments

map for abel maldonado.pdf - Location Map

DWR Use Only

Site Number / State Well Number

N — Latitude Deg/Min/Sec

W — Longitude Deg/Min/Sec

TRS:

APN:

boredata

ELECTRIC - GAMMA RAY-TEMPERATURE LOG

Pilot Borehole

Phone: (888) 908-5226 Fax: (661) 505-6561 Web: www.boredata.com Email: ccorbell@boredata.com

Filing No.

COMPANY Cast Well Drilling

WELL Abel Moldonado

FIELD Santa Maria

STATE California COUNTY Santa Barbara

LOCATION:
Santa Maria Mesa Rd. See GPS coordinates

OTHER SERVICES:

Job No. 2230

SEC: ____ TWP: ____ RGE: ____ LAT.: 34.89636 LONG.: -120.30206

Permanent Datum: Ground Level Elev.: ______ Ft. Elevs.: K.B. ______ Ft.

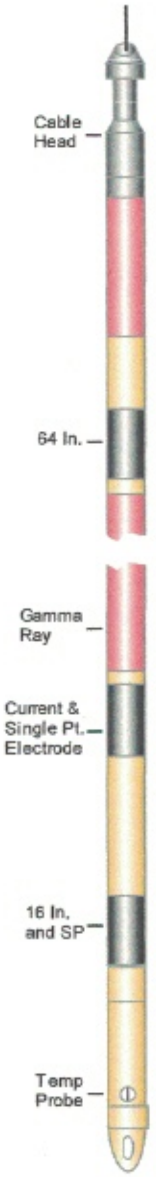
Log Measured From: Ground Level, 0 Ft. Above Perm. Datum D.F. ______ Ft.

Drilling Measured From: Ground Level G.L. ______ Ft.

Run		One										
Date		Nov 08, 2016										
Depth-Driller		600		Ft		Ft		Ft		Ft		
Depth-Logger		600		Ft		Ft		Ft		Ft		
Top Logged Interval		7		Ft		Ft		Ft		Ft		
Btm Logged Interval		600		Ft		Ft		Ft		Ft		
Casing-Driller		N/A	In @	Ft	In @	Ft	In @	Ft	In @	Ft		
Casing - Logger In@Ft			In @	Ft	In @	Ft	In @	Ft	In @	Ft		
Bit Size			In @	Ft	In @	Ft	In @	Ft	In @	Ft		
Time On Bottom		10:30										
Type Fluid in Hole		Bentonite										
Density	Viscosity											
pH	Fluid Loss			ml		ml		ml		ml		
Source of Sample		Circ										
Rm @ Mea. Temp		7	@	75	°F	@	°F	@	°F	@	°F	
Rmf @ Mea. Temp		7	@	75	°F	@	°F	@	°F	@	°F	
Rmc @ Mea. Temp			@		°F	@	°F	@	°F	@	°F	
Source Rmf	Rmc	Meas										
Rm @ BHT			@		°F	@	°F	@	°F	@	°F	
Time Since Circ.		3		Hr		Hr		Hr		Hr		
Max. Rec. Temp.		72.8		°F		°F		°F		°F		
Van No.	Location	BD-1	Bfld									
Recorded By		Craig Corbell										
Witnessed By		Roberta Haylock										

This Eagle Plot Heading Conforms To API RP 31A

ELECTRIC - GAMMA RAY-TEMPERATURE LOG TOOL



SPONTANEOUS POTENTIAL LOGS:
SP Logs record potentials or voltages developed between the borehole fluid and the surrounding formation and are representations of lithology and water quality. Recording of SP logs are limited to water-filled or mud-filled open holes.

NORMAL RESISTIIVITY LOGS:
Normal Resistivity Logs record the electrical resistivity of the borehole environment with lower resistivities indicative of clays and higher resistivities being sands and gravels. Normal resistivity logs are affected by bed thickness, Borehole diameter and borehole fluid.

SINGLE POINT RESISTIVITY LOGS:
Single Point Resistivity Logs record the electrical resistance from points within the borehole to an electrical ground at land surface. Single-point resistance logs are useful in the determination of lithology, water quality, and location of fracture zones.

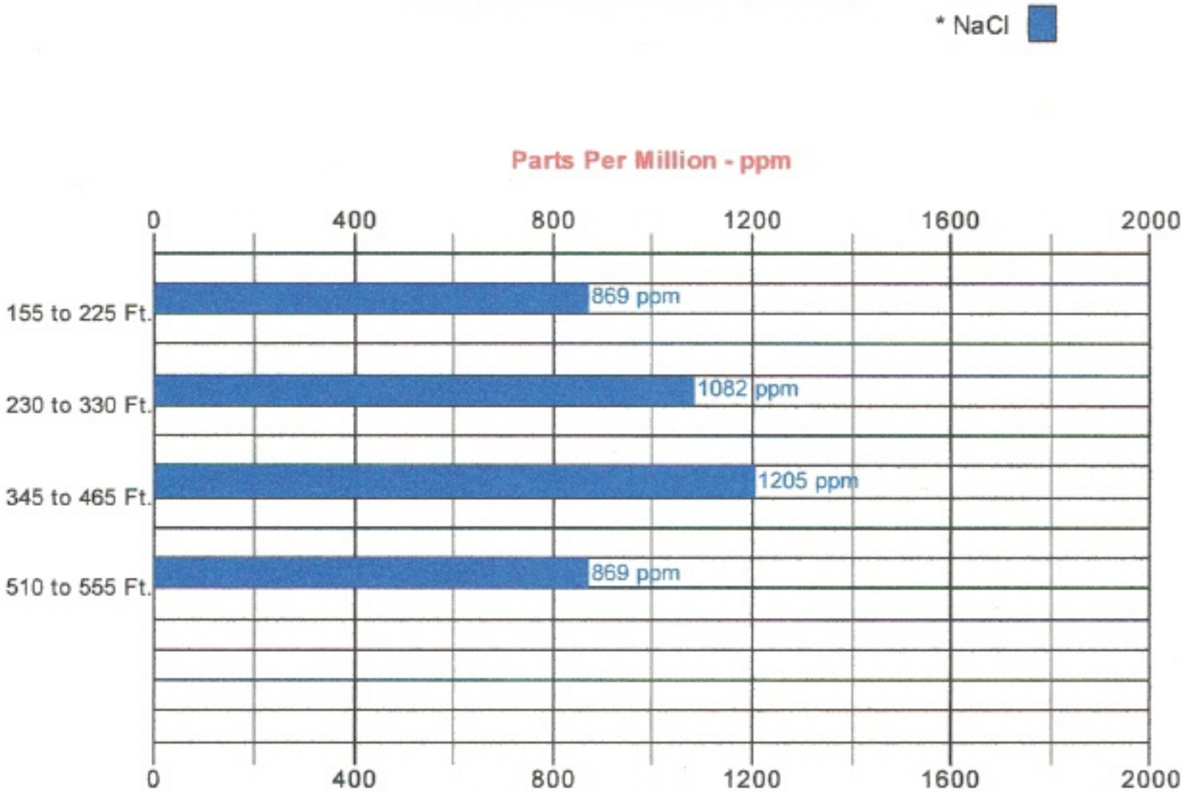
GAMMA RAY LOGS:
Gamma Ray Logs record the amount of natural gamma radiation emitted by the rocks surrounding the borehole. The most significant naturally occurring sources of gamma radiation are potassium 40 and daughter products of the uranium and thorium decay series. Clay and shale bearing rocks commonly emit relatively high gamma radiation because they include weathering products of potassium feldspar and mica and tend to concentrate uranium and thorium by ion absorption and exchange.

TEMPERATURE LOGS:
Temperature Logs record the water temperature in the borehole. Temperature logs are useful for delineating water-bearing zones and identifying vertical flow in the borehole between zones of differing hydraulic head penetrated by wells. Borehole flow between zones is indicated by temperature gradients that are less than the regional geothermal gradient.

ELECTRIC LOG SPECIFICATIONS:

Diameter	1.73 Inches
Length	8.37 Feet
Weight	21.7 Lbs.
Max. Temp	158° F
Resist. Range	0 - 10,000 ohm-m
Gamma Ray	1.97 inches long x.98 inches diameter Scintillation crystal

TOTAL DISSOLVED SOLIDS



TDS Classes

Class 1: Excellent to Good – Less than 700 ppm
Class 2: Good to Injurious – 700 to 2000 ppm
Class 3: Injurious to Poor – More than 2000 ppm

NaCl = Sodium Chloride

METHODOLOGY TO CALCULATE TDS FROM THE SP CURVE

Obtain freshly circulated mud and use a mud press to measure $R_{mf.}$:

Obtain SSP from SP to make these calculations:

1. R_{mf}^{Corr} = [R_{mf} @ meas temp x (Temp +6.77) / 81.770]
2. R_{we} = R_{mf}^{Corr} / $10^{(ssp/\cdot 70.7)}$
3. R_w(NaCL) = ($R_{we}^{1.227}$) x .0825
4. R_w($NaHCO^3$) = R_w x (NaCl / 0.85)

Solving for Electrical Conductivity (EC):

5. NaCl in MilliSiemens/cm^3 =10,000 / R_w(NaCL)
6. $NaHCO^3$ in MilliSiemens/cm^3 = 10,000 / R_w($NaHCO^3$)

Solving for Total Dissolved Solids (TDS):

7. NaCl in ppm = 5300 / R_w(NaCL)
8. $NaHCO^3$ in ppm = 10000 / R_w(NaCL)

REFERENCES:

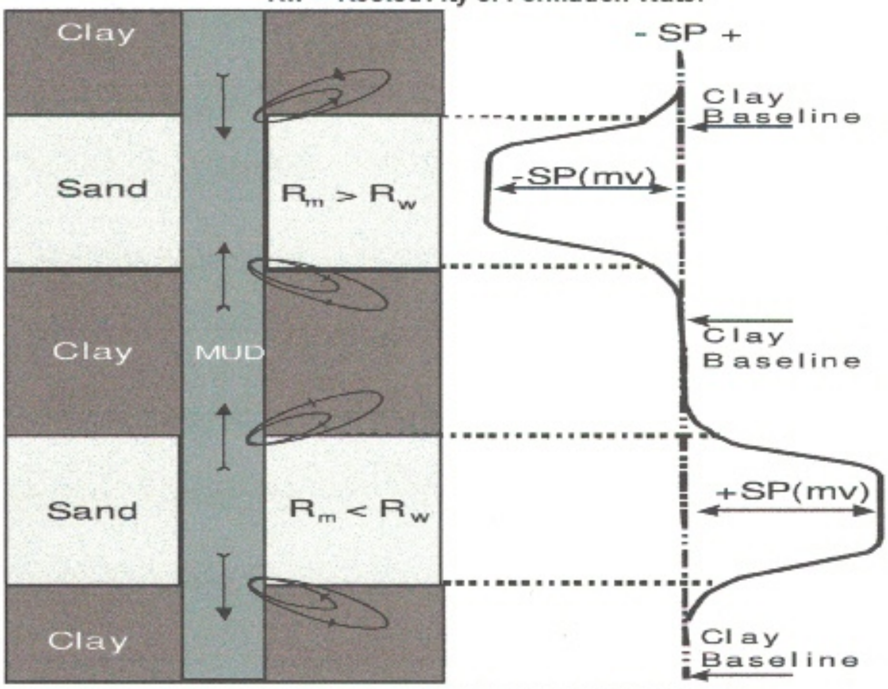
WWW.EPA.GOV?OGWDW/UIC/PDFS/HISTORICAL/STUDY_UIC_METHODS_TDS_CONC_1988.PDF

WWW.WELLLOG.COM/TDS.HTM

THE DEVELOPMENT OF THE SP CURVE

Rm = Resistivity of Mud

Rw = Resistivity of Formation Water



The Liquid Junction Potential is important for SP development. This type of potential develops when two electrolytes of different concentrations containing ions of different mobilities come in contact with each other. The Electric Log Tool is designed to measure that potential displayed as the SP Curve.

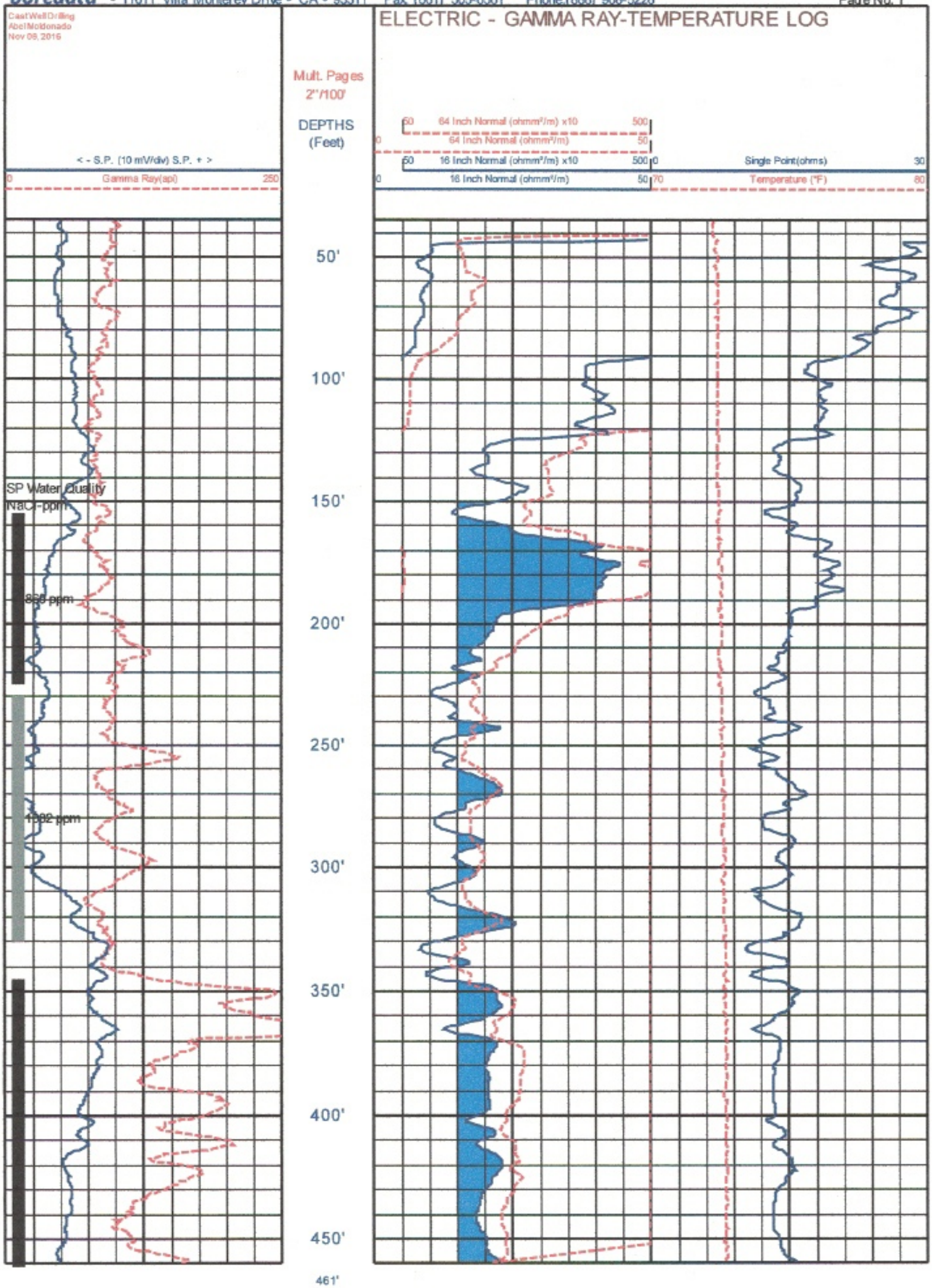
NOTICE

All interpretations are opinions based on inferences from electrical and other measurements and we do not guarantee the accuracy or correctness of any verbal or written interpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by one of our officers, agents or employees. These interpretations are also subject to our General Terms and Conditions as set out in our current Price Schedule.

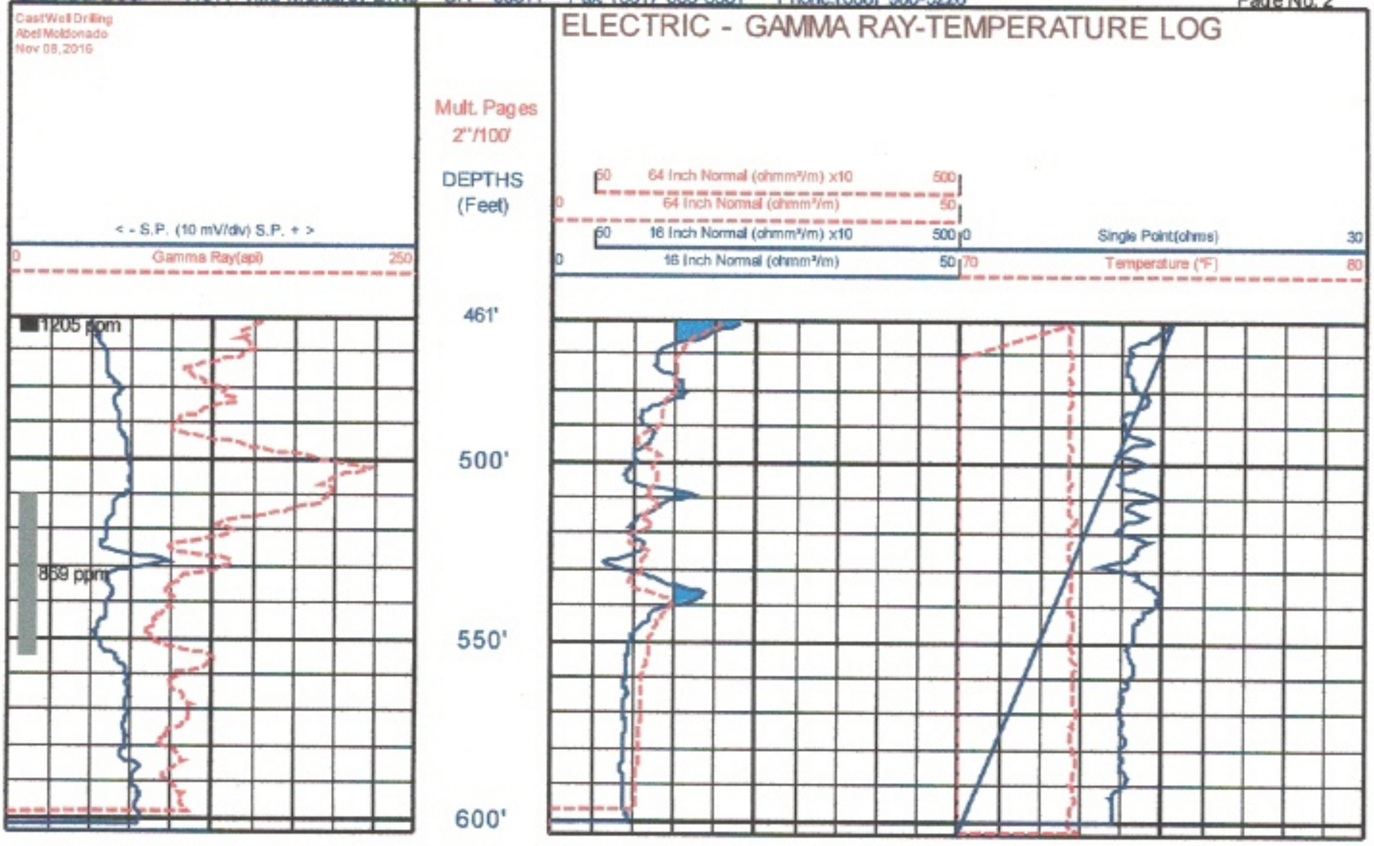
REMARKS

boredata - 11011 Villa Monterey Drive - CA - 93311 Fax (661) 505-6561 Phone:(888) 908-5226

ELECTRIC - GAMMA RAY-TEMPERATURE LOG



boredata - 11011 Villa Monterey Drive - CA - 93311 Fax (661) 505-6561 Phone:(888) 908-5226



Log Depth 602.5'

Compost and Mulch Use in Agriculture: Organic Materials Management

California Agriculture
Organic Agriculture
Rangeland
Nutrients

Compost Use Guidelines
Agriculture Use of Mulch
On-Farm Composting
Food Safety

Grant Funds for Agriculture
Compost and Mulch
Where to buy Compost & Mulch
Additional Resources

Use of composted manures and plant materials in farming date to the earliest beginnings of agriculture. Modern agriculture uses compost and mulch on annual crops, perennials, orchards, vineyards, and grasslands. Compost improves soil properties, provides nutrients in a stable organic form, increases plant growth and health, and conserves water. Mulch reduces weed germination, moderates soil temperature, and conserves water.

California Agriculture

Agriculture is the single largest market for compost in California. The California Compost Coalition estimates irrigated cropland in the state uses 7.5 million tons of bulk compost annually. California farmers enjoy access to high-quality compost and mulch products virtually everywhere in the state. California compost facilities permitted in accordance with state law and CalRecycle regulations, and inspected by our network of local enforcement agencies (LEA), meet high standards for pathogen reduction and testing of final product. Additionally, California Department of Food and Agriculture conducts annual inspections of compost facilities that sell to organic food producers to ensure strict adherence to National Organic Program (NOP) regulations. The Third Assessment of California's Compost and Mulch-Producing Infrastructure identified the major crop types using compost in California.

Organic Agriculture

In 2015, according to CDFA, organic agriculture in California grew to 687,000 acres and topped $2.2 billion in value, which represents approximately 40% of the nation's organic production. Organic crop inputs, such as compost, are required to meet USDA National Organic Program (USNOP) requirements. The California State Organic Program (CASOP) is the only program approved by the USDA National Organic Program, and it is co-administered by the California Department of Food and Agriculture (CDFA) for organic producers and the California Department of Public Health (CDPH) for organic products. The CASOP oversees production and handling operations within the state. The Organic Materials Review Institute (OMRI) provides an independent review of compost products for organic farming. Many growers use OMRI-certified compost to ensure it is compliant with USNOP requirements.

- Read about Compost Approved for Use in Organic Production (Organic Materials Review Institute)
- Read about Mulches for Organic Farming: USDA Conservation Job Sheet 484.1

Rangeland

Rangeland ecosystems cover approximately half the land area of California. In the last several years, there has been a movement to use enhanced land management or conservation agriculture practices, including compost use, to increase carbon sequestration (i.e., long-term storage of carbon in soils and vegetation) on these lands. Compost use on rangelands increases grassland productivity, carbon sequestration, and water conservation.


Rangeland/pasture

Benefits of Compost and Mulch Use

Regular use of compost and mulch brings many benefits to the farmer. Benefits will vary for farmers based on frequency and amount of compost applied, soil type, crop rotations, and other factors. Benefits include:

- Improves plant growth and health
- Provides organic matter
- Provides plant nutrients in a stable organic form
- Improves soil tilth
- Beneficial micro-organisms to improve soil health
- Sequesters carbon
- Increases plant rooting depth
- Improves physical, biological, and chemical soil properties
- Reduces erosion
- Increases water holding capacity and reduces runoff
- Conserves water
- Mulch reduces weed germination and moderates soil temperature

Nutrients

Compost provides low levels of all primary, secondary, and micronutrients. Many micronutrients become depleted from agricultural lands over time and may not be replenished with conventional fertilizers. Compiled analyses of more than 1,600 compost samples from the southwestern United States performe[redacted] by Soil Control Lab found these levels of micronutrients.

The Marin Carbon Project is performing a long-term experiment using large quantities of compost to improve forage on California rangeland. Early results suggest significant improvements in forage quality and quantity, benefits to native perennial grasses, and significant soil carbon sequestration. The work includes a suite of farm management practices to complement compost application in a manner that builds soil carbon and soil health and improves productivity. Each farm has developed a comprehensive carbon farm plan, including known climate-beneficial practices such as windbreaks, riparian and range management improvements, and grass, plant and tree establishment.

Read about the '4 per Thousand' initiative, launched at the Paris Climate conference, to implement practical actions on soil carbon storage and encourage ag and other stakeholders to transition towards a productive, highly resilient agriculture that creates jobs and ensures sustainability.

Compost Use Guidelines

Compost characteristics and application rates for crops are dependent on soil properties and crop type. Many growers rely on soil testing and crop advisers to determine suitable compost application rates based on compost properties, including levels of nutrients and organic matter, maturity, stability, pH, particle size, and other parameters.

Test compost to ensure it meets specifications. The USCC's Seal of Testing Assurance (STA) Program uses standardized testing methodologies, certified laboratories, and reports test results so that users can determine if a given compost product is suitable for its intended use.

Crop-specific salinity thresholds require that growers consider compost salinity, pre-compost salinity, compost application rate, soil organic matter, and soil texture. A tool developed by UCANR (see p. 5 of Assessing Compost Quality for Agriculture) allows growers to estimate initial compost-soil mixture salinity levels.

USCC Field Guide to Compost Use

Agricultural Use of Mulch

Agricultural markets for mulch products continue to grow, most of which is green material applied to agricultural land as mulch. Use mulch in agriculture for erosion control, disease and weed suppression, water conservation, and to reduce soil compaction and allow access after heavy rainfall.

On-Farm Composting

Agriculture uses compost produced both outside and on-farm. On-farm compost, produced from plant residues generated on the farm as well as yard trimmings and other materials from cities, provides many benefits. On-farm composting may be subject to CalRecycle regulations, depending on the volume of material on site, amount sold or given away, and other factors.

- On-Farm Composting (CalRecycle)
- CalRecycle Composting Regulations

Food Safety

Rules, regulations, and agreements ensure organic inputs such as compost protect food safety.

- Leafy Greens Marketing Agreement: Industry standards for farmers growing salad greens who use manures, composts and other fertilizers.
- U.S. Food and Drug Administration (FDA) Produce Safety Rule: Questions and answers on the proposed rule for produce safety. This rule is one of five proposed rules that would be foundational in the food safety system mandated by the FDA Food Safety Modernization Act.

Grant Funds for Agriculture

Grant funds assist agriculture in improving soil health by building soil organic matter with compost and mulch, and cleanup of illegal solid waste sites on farm or ranch property.

Healthy Soils Initiative. In 2015, Governor Brown's administration, recognizing the importance of soil health, established the Healthy Soils Initiative, with CalRecycle and the California Department of Food and Agriculture (CDFA) as lead agencies. Goals for this initiative include building soil organic matter, increasing climate resiliency and maintaining high yields. The Healthy Soils Program (HSP) provides grants for projects that use compost and mulch, the HSP Incentives Program and the HSP Demonstration Projects. The HSP Incentives Program provides grants for projects that implement conservation management practices that improve soil health, sequester carbon, and reduce greenhouse gas (GHG) emissions. The HSP Demonstration Projects provides grants for on-farm demonstration projects that conduct research and/or showcase conservation management practices that reduce GHG emissions and improve soil health and create a platform promoting widespread adoption of conservation management practices throughout the state.

Farm and Ranch Solid Waste Cleanup and Abatement Grant Program. CalRecycle's Farm and Ranch Cleanup Grants provides up to $1 million annually in grants for cleanup of illegal solid waste sites on farm or ranch property zoned for agricultural use where unauthorized solid waste disposal has occurred.

Compost and Mulch Use

- Agricultural Demonstration Projects. CalRecycle funded various partnerships that proposed large-scale demonstrations between 1994 and 2002. These partnerships involved commercial growers throughout California monitoring the effects of compost, composted mulch or green material (e.g., yard trimmings) on various commodity crops by examining one or more of the following--crop yields, incidence of plant disease, compost characteristics, soil profiles, or measurable soil erosion.

Where to Buy Compost in California

- Compost Source Locator (U.S. Composting Council)
- FindAComposter.com (*BioCycle*)

Additional Resources

- Alternative Farming Systems Information Center: Specializes in library services related to aspects of alternative agriculture, such as sustainable crop and livestock farming systems, ecological pest management, and organic production, certification, and marketing.

- *BioCycle* article: Applying Compost in Mainstream Agriculture, Ralph Jurgens.
- Planting Seeds: Food and Farming News from CDFA
- University of California Agriculture Website
- U.S. Department of Agriculture: Natural Resources Conservation Service Website
- Nutrient Management Tools (CDFA)

Last updated: February 3, 2021
Compost Use in Agriculture: http://www.calrecycle.ca.gov/Organics/Farming/
Contact: Compost Use in Agriculture organics@calrecycle.ca.gov

Compost and Mulch Use in Agriculture: Organic Materials Management

California Agriculture
Organic Agriculture
Rangeland
Nutrients

Compost Use Guidelines
Agriculture Use of Mulch
On-Farm Composting
Food Safety

Grant Funds for Agriculture
Compost and Mulch
Where to buy Compost & Mulch
Additional Resources

Use of composted manures and plant materials in farming date to the earliest beginnings of agriculture. Modern agriculture uses compost and mulch on annual crops, perennials, orchards, vineyards, and grasslands. Compost improves soil properties, provides nutrients in a stable organic form, increases plant growth and health, and conserves water. Mulch reduces weed germination, moderates soil temperature, and conserves water.

California Agriculture

Agriculture is the single largest market for compost in California. The California Compost Coalition estimates irrigated cropland in the state uses 7.5 million tons of bulk compost annually. California farmers enjoy access to high-quality compost and mulch products virtually everywhere in the state. California compost facilities permitted in accordance with state law and CalRecycle regulations, and inspected by our network of local enforcement agencies (LEA), meet high standards for pathogen reduction and testing of final product. Additionally, California Department of Food and Agriculture conducts annual inspections of compost facilities that sell to organic food producers to ensure strict adherence to National Organic Program (NOP) regulations. The Third Assessment of California's Compost and Mulch-Producing Infrastructure identified the major crop types using compost in California.

Organic Agriculture

In 2015, according to CDFA, organic agriculture in California grew to 687,000 acres and topped $2.2 billion in value, which represents approximately 40% of the nation's organic production. Organic crop inputs, such as compost, are required to meet USDA National Organic Program (USNOP) requirements. The California State Organic Program (CASOP) is the only program approved by the USDA National Organic Program, and it is co-administered by the California Department of Food and Agriculture (CDFA) for organic producers and the California Department of Public Health (CDPH) for organic products. The CASOP oversees production and handling operations within the state. The Organic Materials Review Institute (OMRI) provides an independent review of compost products for organic farming. Many growers use OMRI-certified compost to ensure it is compliant with USNOP requirements.

- Read about Compost Approved for Use in Organic Production (Organic Materials Review Institute)
- Read about Mulches for Organic Farming: USDA Conservation Job Sheet 484.1

Rangeland

Rangeland ecosystems cover approximately half the land area of California. In the last several years, there has been a movement to use enhanced land management or conservation agriculture practices, including compost use, to increase carbon sequestration (i.e., long-term storage of carbon in soils and vegetation) on these lands. Compost use on rangelands increases grassland productivity, carbon sequestration, and water conservation.

Rangeland/pasture

Benefits of Compost and Mulch Use

Regular use of compost and mulch brings many benefits to the farmer. Benefits will vary for farmers based on frequency and amount of compost applied, soil type, crop rotations, and other factors. Benefits include:

- Improves plant growth and health
- Provides organic matter
- Provides plant nutrients in a stable organic form
- Improves soil tilth
- Beneficial micro-organisms to improve soil health
- Sequesters carbon
- Increases plant rooting depth
- Improves physical, biological, and chemical soil properties
- Reduces erosion
- Increases water holding capacity and reduces runoff
- Conserves water
- Mulch reduces weed germination and moderates soil temperature

Nutrients

Compost provides low levels of all primary, secondary, and micronutrients. Many micronutrients become depleted from agricultural lands over time and may not be replenished with conventional fertilizers. Compiled analyses of more than 1,600 compost samples from the southwestern United States perform[redacted] by Soil Control Lab found these levels of micronutrients.

The Marin Carbon Project is performing a long-term experiment using large quantities of compost to improve forage on California rangeland. Early results suggest significant improvements in forage quality and quantity, benefits to native perennial grasses, and significant soil carbon sequestration. The work includes a suite of farm management practices to complement compost application in a manner that builds soil carbon and soil health and improves productivity. Each farm has developed a comprehensive carbon farm plan, including known climate-beneficial practices such as windbreaks, riparian and range management improvements, and grass, plant and tree establishment.

Read about the '4 per Thousand' initiative, launched at the Paris Climate conference, to implement practical actions on soil carbon storage and encourage ag and other stakeholders to transition towards a productive, highly resilient agriculture that creates jobs and ensures sustainability.

Compost Use Guidelines

Compost characteristics and application rates for crops are dependent on soil properties and crop type. Many growers rely on soil testing and crop advisers to determine suitable compost application rates based on compost properties, including levels of nutrients and organic matter, maturity, stability, pH, particle size, and other parameters.

Test compost to ensure it meets specifications. The USCC's Seal of Testing Assurance (STA) Program uses standardized testing methodologies, certified laboratories, and reports test results so that users can determine if a given compost product is suitable for its intended use.

Crop-specific salinity thresholds require that growers consider compost salinity, pre-compost salinity, compost application rate, soil organic matter, and soil texture. A tool developed by UCANR (see p. 5 of Assessing Compost Quality for Agriculture) allows growers to estimate initial compost-soil mixture salinity levels.

USCC Field Guide to Compost Use

Agricultural Use of Mulch

Agricultural markets for mulch products continue to grow, most of which is green material applied to agricultural land as mulch. Use mulch in agriculture for erosion control, disease and weed suppression, water conservation, and to reduce soil compaction and allow access after heavy rainfall.

On-Farm Composting

Agriculture uses compost produced both outside and on-farm. On-farm compost, produced from plant residues generated on the farm as well as yard trimmings and other materials from cities, provides many benefits. On-farm composting may be subject to CalRecycle regulations, depending on the volume of material on site, amount sold or given away, and other factors.

- On-Farm Composting (CalRecycle)
- CalRecycle Composting Regulations

Food Safety

Rules, regulations, and agreements ensure organic inputs such as compost protect food safety.

- Leafy Greens Marketing Agreement: Industry standards for farmers growing salad greens who use manures, composts and other fertilizers.
- U.S. Food and Drug Administration (FDA) Produce Safety Rule: Questions and answers on the proposed rule for produce safety. This rule is one of five proposed rules that would be foundational in the food safety system mandated by the FDA Food Safety Modernization Act.

Grant Funds for Agriculture

Grant funds assist agriculture in improving soil health by building soil organic matter with compost and mulch, and cleanup of illegal solid waste sites on farm or ranch property.

Healthy Soils Initiative. In 2015, Governor Brown's administration, recognizing the importance of soil health, established the Healthy Soils Initiative, with CalRecycle and the California Department of Food and Agriculture (CDFA) as lead agencies. Goals for this initiative include building soil organic matter, increasing climate resiliency and maintaining high yields. The Healthy Soils Program (HSP) provides grants for projects that use compost and mulch, the HSP Incentives Program and the HSP Demonstration Projects. The HSP Incentives Program provides grants for projects that implement conservation management practices that improve soil health, sequester carbon, and reduce greenhouse gas (GHG) emissions. The HSP Demonstration Projects provides grants for on-farm demonstration projects that conduct research and/or showcase conservation management practices that reduce GHG emissions and improve soil health and create a platform promoting widespread adoption of conservation management practices throughout the state.

Farm and Ranch Solid Waste Cleanup and Abatement Grant Program. CalRecycle's Farm and Ranch Cleanup Grants provides up to $1 million annually in grants for cleanup of illegal solid waste sites on farm or ranch property zoned for agricultural use where unauthorized solid waste disposal has occurred.

Compost and Mulch Use

- Agricultural Demonstration Projects. CalRecycle funded various partnerships that proposed large-scale demonstrations between 1994 and 2002. These partnerships involved commercial growers throughout California monitoring the effects of compost, composted mulch or green material (e.g., yard trimmings) on various commodity crops by examining one or more of the following--crop yields, incidence of plant disease, compost characteristics, soil profiles, or measurable soil erosion.

Where to Buy Compost in California

- Compost Source Locator (U.S. Composting Council)
- FindAComposter.com (*BioCycle*)

Additional Resources

- Alternative Farming Systems Information Center: Specializes in library services related to aspects of alternative agriculture, such as sustainable crop and livestock farming systems, ecological pest management, and organic production, certification, and marketing.

- *BioCycle* article: Applying Compost in Mainstream Agriculture, Ralph Jurgens.
- Planting Seeds: Food and Farming News from CDFA
- University of California Agriculture Website
- U.S. Department of Agriculture: Natural Resources Conservation Service Website
- Nutrient Management Tools (CDFA)

Last updated: February 3, 2021
Compost Use in Agriculture: http://www.calrecycle.ca.gov/Organics/Farming/
Contact: Compost Use in Agriculture organics@calrecycle.ca.gov

Bosarge Environmental, LLC
707 Bienville Blvd.
Ocean Springs, MS 39564
(228) 217-3180

October 18, 2019

Sara Rotman
1180 West Highway 246
Buellton, CA 93427

RE: Odor Assessment Study

Introduction

Sara Rotman retained Bosarge Environmental, LLC, as a third-party Odor Expert, to perform an Odor Assessment Study of a property in the vicinity of 1180 West Highway 246 in Buellton, California. Ms. Melanie Bosarge conducted ambient odor surveys the three days of July 22- 24, 2019. This time frame was selected because the farm was in full flowering stage. During this period, the farm would have a crop of fully formed flowering cannabis plants at the stage when terpene odor is the greatest, creating a "worst-case-scenario" of odor for the farm.

Ms. Bosarge is a Chemical Engineer and Owner/Manager of Bosarge Environmental, LLC. She has represented St. Croix Sensory (St. Croix) as a certified instructor and provided client training and odor assessment services, as an independent contractor, since 2002. For more than thirty-five (35) years, St. Croix has been assisting facility owners, consulting engineering firms, and regulatory agencies to quantify odors from a variety of industrial, agricultural, and municipal operations, including wastewater treatment, landfills, composting, and manufacturing in both field and laboratory settings. St. Croix manufactures and markets state-of-the-art odor sampling and measurement equipment, including the Nasal Ranger Olfactometer. St. Croix's "ODOR SCHOOL"® is an internationally recognized program to prepare inspectors to conduct field evaluations of ambient odors.

Ambient Odor Assessment Methodology

Odor surveys were conducted using a Nasal Ranger field olfactometer to quantify odor strength when odor was noticed at each monitoring location. Prior to odor observations, a carbon mask respirator was utilized to "zero" nose to 100%. Upon arrival at each separate location, ambient odor was assessed with the "naked nose". If no odor was detected, the current time and "non-detected" (ND) was recorded. If an odor was detected, a reading was then taken with Nasal Ranger Olfactometer.

Using the Nasal Ranger, odor strength is measured as dilution ratios, reported as Dilution-to-Threshold (D/T) values. The Nasal Ranger Dilution-to-Threshold odor measurement is an "instantaneous" measurement, which is a recognition threshold. For example, a 4-D/T is the dilution ratio of 4-volumes of carbon filtered odor free air mixed with one-volume of ambient (odorous) air that makes the ambient odorous air "just-barely-recognizable" as an odor.

The D/T dilution ratio steps of the Nasal Ranger olfactometer used for the odor surveys were 2, 4, 7, 15, 30, and 60. If an odor was detected with the "naked nose" at a location, a measurement was taken with the Nasal Ranger. An odor in the air that is not measured at the 2-D/T dilution ratio is reported as less than 2-D/T (<2). The absence of ambient odor is reported as "non-detected" (ND).

Odor Survey – Introduction and Mapping

Upon arrival at the farm on the afternoon of July 22, 2019, Ms. Bosarge was taken on an extensive tour of the site. Each area of the property and cannabis process was identified and explained. A plan of action was developed and coordinated. Ms. Bosarge investigated the area within the security fenced area, the property outside of the fenced area along accessible property lines, and residential, commercial and agricultural areas throughout Buellton. Meteorological conditions were recorded and several locations were mapped and designated as survey locations. No odors were detected past the perimeter of the property during this initial investigation.

After the initial tour, Ms. Bosarge continued independently to develop a monitoring plan and complete several additional surveys during the three-day odor assessment study. Approximately twenty-five (25) locations within the property lines, approximately twelve (12) locations close to the facility along Highway 246, approximately twelve (12) locations along Santa Rosa Road and approximately twenty-five (25) locations in the surrounding residential community were designated and mapped by recording latitude and longitude coordinates at each location. Unique identification codes were assigned to each location. Latitude and longitude coordinates for each location are being entered into Odor Tracker software to produce Google Earth Maps of the areas within the property, along the perimeter of the property and the surrounding community.

Odor Survey – Discussion

Five (5) ambient odor surveys were conducted offsite during the three-day study. Two (2) odor surveys were conducted within the property lines. During each survey, the date, time, odor reading and meteorological conditions, including temperature, humidity, precipitation, sky conditions, wind speed and wind direction were recorded at each location. Each survey was recorded separately and odor survey data reports will appear in the final report.

Approximately two hundred (200) odor observations were conducted and recorded. Since odor detection was so low during the first day of the Odor Study, Ms. Bosarge elected to designate a few locations along the fence line just within the farm and areas next to the crops. Odors ranged from "non-detected" to <2 D/T, to 2 D/T and up to 4 D/T at one area. These areas were next to the fully formed and flowering plants. These levels are extremely low for onsite operations.

Odor Survey Conclusions

In most cases of odor detection, within property boundaries, the odor was faint and intermittent at each of the locations where <2 D/T was recorded. These locations were generally directly downwind of growing operations. This value indicates a barely discernible odor with the "naked nose", but under the threshold to be considered a recognizable odor with the Nasal Ranger Olfactometer on the lowest setting of 2-D/T. Odors ranged from "non-detected" to <2 D/T, to 2 D/T and up to 4 D/T at areas next to the fully formed and flowering plants.

No odors were detected at any of the other designated locations throughout the Buellton Community, during the three-day Odor Study.

Based on the findings in this Odor Study, Bosarge Environmental, LLC, concludes that "no discernible cannabis odor" was detected outside the property's boundaries and is barely recognizable at the perimeter of the property and should not adversely affect the surrounding community.

Submitted by,

Melanie Bosarge

Melanie Bosarge
Bosarge Environmental, LLC

SESPE CONSULTING, INC.

MEMORANDUM

468 Poli Street, Suite 2E • Ventura, California 93001

Date: October 18, 2019

To: Ms. Sara Rotman, Busy Bee Organics

From: Scott Cohen, P.E., C.I.H. and Andre Almeida, P.E.

Re: Cannabis Odor Modeling

Sespe was hired to perform independent air quality analysis to clarify relative odor impacts from the subject property (Figure 1) and provide expert testimony regarding methods that were used and findings of the analytical effort.

Methods used in preparing this memo are the same as those used for industrial projects that emit air pollutants. Air pollution engineering and analysis is one of Sespe's core services and staff has assessed many industrial projects for significance of air quality impacts and air quality health risk assessment impacts. Resumes for Sespe staff that performed this work and briefs describing similar air quality projects are provided in Attachment 3.

In order to determine the relative impact of odor on various locations surrounding the Busy Bee Organics site, this document describes the existing setting and quantifies the severity and frequency of potential odor episodes.

1.0 EXISTING SETTING

The Project proposes to cultivate cannabis on 22 acres of the 64 acre parcel or approximately one-third of the available space. The parcel is located within lands zoned for agricultural use and specifically cannabis cultivation as described in applicable County Ordinances, Programs guidelines, and an existing programmatic environmental impact report (PEIR) that assessed impacts from cannabis cultivation during approval of those ordinances and programs. As discussed in the Staff Report, the Project including potential odor is consistent with the Ordinance and PEIR. Thus, additional analysis may not be required.

In addition to the land use and cannabis related ordinances and requirements, the County Air Pollution Control District Rule 303 (and California Health & Safety Code from which it derives its authority) prohibits nuisance as follows:

> *A person shall not discharge from any source whatsoever such quantities of air contaminants or other material in violation of Section 41700 of the Health and Safety Code which cause injury, detriment, nuisance or annoyance to any considerable number of persons or to the public or which endanger the comfort, repose, health or safety or any such persons or the public or which cause or have a natural tendency to cause injury or damage to business or property.*
> https://www.ourair.org/wp-content/uploads/rule303.pdf

Accordingly, odor emissions may be a nuisance if the following are true:

1. Injury, detriment, nuisance or annoyance results from the odor and the odor affects a considerable number of persons or the public; or
2. The odor endangers the comfort, repose, health or safety or any such [considerable number of] persons or the public; or
3. The odor causes or has a natural tendency to cause injury or damage to business or property.

If the County were to receive an odor complaint, Rule 303 is a standard by which the complaint and conditions on the ground would be evaluated. There have been eight (8) harvests of cannabis grown on the property since 2014. The County has not received any odor complaints related to this site.

Various documents relevant to cannabis are available on the APCD land use webpage under the subheading "Cannabis and Air Quality."[1]

2.0 ODOR MODELING

Information regarding cannabis odor was collected from resources referenced herein. In general, research indicates that the state-of-science remains lacking for this nascent industry. Nevertheless, Sespe was able to exercise some professional judgment and collect sufficient information from several sources to prepare an air dispersion model. Model results are consistent with the history of the site in which no complaints have been made. Model background, parameters and results are discussed below.

The United States Environmental Protection Agency (EPA) AERMOD (version 19191) gaussian dispersion model as implemented by the Lakes Environmental AERMOD View software package was used to predict concentrations of several odorous compounds that were described in the literature review. The AERMOD dispersion model is the preferred model by EPA (see Title 40 Code of Federal

[1] https://www.ourair.org/land-use/

Regulations Section 51, Appendix W)[2], CARB (see HARP webpage)[3], and Santa Barbara County APCD (Modeling Guidelines for Air Quality Impact Assessment, April 2019)[4]. AERMOD is used by all types of industrial sources that emit pollutants to demonstrate that new and modified sources will not result in concentrations that exceed or contribute to an existing exceedance of an ambient air quality standard (AAQS). In addition, California agencies and air districts throughout the State use AERMOD to assess health risk from toxic air contaminants (TACs) under the AB 2588 Air Toxics Hot Spot Program and as needed to evaluate potential impacts under CEQA. Thus, it is appropriate to use AERMOD to evaluate potential for odor conditions around the Busy Bee Organics Project site.

2.1 Meteorological Data

One of the primary inputs to AERMOD is hourly wind data. Generally, meteorological stations should be within ten miles of a model domain (i.e., site and receptors) to possibly be considered representative. If no station exists, then prognostic wind data sets generated by the EPA processor software, MMIF, may be used to generate Mesoscale Meteorological 5 (MM5) datasets for use in modeling. In this case, the closest station with wind data is located on H Street in Lompoc. Given the distance and differences in terrain between Lompoc and the model domain, it was determined that MM5 generated wind data would be more representative. Therefore, Lakes Environmental was contracted to generate wind data that would be representative of conditions near the Project site. As discussed above, Lakes Environmental packages EPA AERMOD code and would be expert in assessing the representativeness and of wind datasets and in preparing MM5 data as was done in this case.

Site specific meteorological data for the time period of Jan 1, 2014 to Dec 31, 2018 (Attachment 2) was purchased from Lakes Environmental and used in the AERMOD model to calculate concentration of odorous chemicals in and around the Project site.

Flowering season generally occurs twice a year in June / July and in October / November but can vary depending on seasonal weather conditions. It is during this time that odor is a concern. Wind data was modeled for each of the five (5) years contained in the dataset. Normally, low wind speed results in stagnation and plumes remain more cohesive during stagnation producing the highest model concentrations. High wind periods result in greater dispersion of pollutants and lower concentrations.

Review of the wind dataset shows the frequency of Calm Winds (wind less than 0.97 Knots) was 0.51% during the flowering period. This means that throughout the course of a year, calm winds and potential for related high concentrations of odorous emissions from flowering cannabis may occur simultaneously for 0.1% of the time.

---

[2] https://www.govinfo.gov/content/pkg/CFR-2018-title40-vol2/pdf/CFR-2018-title40-vol2-part51-appW.pdf
[3] https://ww3.arb.ca.gov/toxics/harp/harp.htm
[4] https://www.ourair.org/wp-content/uploads/aqia.pdf

2.2 Cannabis Emissions Rates

The model contains a single area source with initial vertical dimension of 3 meters and initial release height of 1.5 meters emitting uniformly at a constant rate of 0.172 gram per second (g/s). The emissions rate was derived from an assumption that one (1) acre yields 200 kg of dry cannabis product (Kern County Cannabis Land Use Ordinance Project FEIR, July 2017).[5]

A pre-print copy of an article authored by researchers at University of North Carolina at Chapel Hill, University of Colorado at Boulder, Lancaster Environment Centre in United Kingdom, and University of California at Irvine titled "Potential Regional Air Quality Impacts of Cannabis Cultivation Facilities in Denver, Colorado" is under review for possible publication in the journal, Atmospheric Chemistry and Physics (ACP).[6] The article presents "emissions capacity" on a dry weight basis of 100 µg of organic emissions per gram of dry weight cannabis product per hour (µg gdw^{-1} hr^{-1}) which was used with the dry weight per acre to determine the 31-acre site specific emissions rate used in the model (0.172 g/s).[7]

2.3 Odor Thresholds

The Kern County FEIR contains data showing the relative amounts of various odorous chemicals associated with cannabis cultivation and an "ODT" odor threshold for each. The ODT is defined as the concentration of a compound that may be detectable by fifty-percent (50%) of the population and states that "nuisance levels typically occur at concentrations that are several multiples higher than the ODT." Thus, using the ODT as a threshold for nuisance should be overly conservative and is the approach taken in evaluating the model results. Table 1 presents the relative rate of emissions and ODTs used to obtain the weighted ODT of 28.1 ppb that was applied to modeled data in order to produce an isopleth representative of the ODT for the mixture of odorous chemicals.

Table 1. Odor Thresholds

Chemical	Emissions Rate (g/s)	Relative Emissions	ODT (ppm)	Weighted ODT (ppm)
Benzaldehyde	2.59E-05	53.7%	4.17E-02	0.02240
Myrcene	2.05E-05	42.5%	1.30E-02	0.00553
Decanal	1.72E-07	0.4%	8.97E-04	0.00000
Heptanal	1.64E-06	3.4%	4.79E-03	0.00016
Mixture ODT:				0.02810

[5] https://kernplanning.com/environmental-doc/kern-county-cannabis-land-use-ordinance-project/
[6] https://www.atmos-chem-phys-discuss.net/acp-2019-479/
[7] The Project site is 64 acres of which 31 acres are outside the riverbed and 22 acres (about one-third of the Project site) would be used for cannabis cultivation. The cannabis emissions modeled are based on the 31-acre value. Thus, the mass of emissions in the model is approximately 30% greater than necessary leading to odor estimates that are overly conservative.

2.4 Model Results

AERMOD produces output in units of µg/m^3 and the Lakes Environmental software contains a tool for converting results to other units. It was assumed that the average chemical weight for these compounds is 136.1 grams per gram-mole (g/g-mole) which is a value reported for myrcene and several other terpenes.[8] Using the chemical weight, the model results were converted to parts per billion (ppb). Parts per billion concentration of the mixture was then divided by the mixture ODT (28.1 ppb) calculated in Table 1 to produce results normalized to the mixture ODT where a value of 1.0 is equal to the ODT, values lower than 1.0 are less than the ODT, and values greater than 1.0 exceed the ODT and are thus much more likely to be detected as odor. Figure 2 shows the model results which indicate that 99.8% of the time the odor is less than 1.0 ODT index at any point in the model domain (i.e., on- or off-site). In addition, the 0.8 odor index isopleth remains within the Project site.

Table 2. Discrete Receptors Including Residences

ID	UTM Zone 11 East (m)	UTM Zone 11 North (m)	Odor Index
1	754344	3834885	0.4497
2	754290	3834924	0.3363
3	754194	3834953	0.2664
4	754392	3834910	0.331
5	754753	3834810	0.2264
6	753826	3834793	0.2447
7	753605	3834813	0.1859
8	753488	3834726	0.1538
9	753451	3834684	0.1443
10	754075	3834453	0.4118
11	753806	3834560	0.2219
12	753812	3834512	0.2064
13	753830	3834454	0.2119
14	754428	3833184	0.06878
15	754658	3833639	0.1277
16	755046	3832953	0.06577
17	755665	3832724	0.06041
18	755090	3834525	0.1791
19	752248	3834465	0.05271
20	752255	3834520	0.05472

Source: Air dispersion modeling (Attachment 3).

[8] https://www.steephill.com/science/terpenes

The two-tenths of one percent (0.2%) of time that ODT may be greater than shown in the model is appropriate given analogous EPA ambient air quality standards which are promulgated as statistical standards. For instance, PM_{10} and $PM_{2.5}$ each are evaluated at the 98th percentile rather than then highest concentration output by the model or measured by an air agency. The form and values of ambient air quality standards are summarized by CARB[9] and contain a footnote which states:

> *National standards (other than ozone, particulate matter, and those based on annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over three years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m^3 is equal to or less than one. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard….*

3.0 CONCLUSION

Air dispersion modeling was performed to estimate the level of odor near the Project site. Concentrations of common odorous compounds found in cannabis and comprising the model output were then converted to an odor index using the odor detection thresholds and weighted amounts of the compounds. Odor indices greater than one (1.0) indicate a greater than 50% likelihood that odor would be detected and indices less than one (1.0) indicates less than 50% likelihood that odor would be detected. As shown on Figure 2, 99.8% of the time the odor index on-site is less than one (i.e., 0.8715 O.I.) and odor index is less than 0.8 O.I. at each location outside the property boundary. The greatest odor index value predicted by the model to occur at a residence is 0.45 O.I. which is exceeded less than 0.2% of the time at UTM Zone 11, 754344 m E, 3834885 m N. Given only half of people would detect odor at 1.0 O.I., much less than half of people would detect odor at residential locations surrounding the Project site. Given the range of odor indices at residences, detection of odor by occupants is considered unlikely resulting in compliance with APCD's Nuisance Rule discussed above and corresponding to a less than significant impact due to odorous emissions from the Project site.

[9] https://ww3.arb.ca.gov/research/aaqs/aaqs2.pdf

ATTACHMENT 1
Figures

PROJECT TITLE:

Discrete Sources & Receptors
Busy Bee Organics

COMMENTS:

SOURCES:
1

RECEPTORS:
1576

NOTICE:

MODELER:
SDC

DATE:
9/13/2019

SCALE: 1:32,437

0 1 km

SESPE CONSULTING, INC.

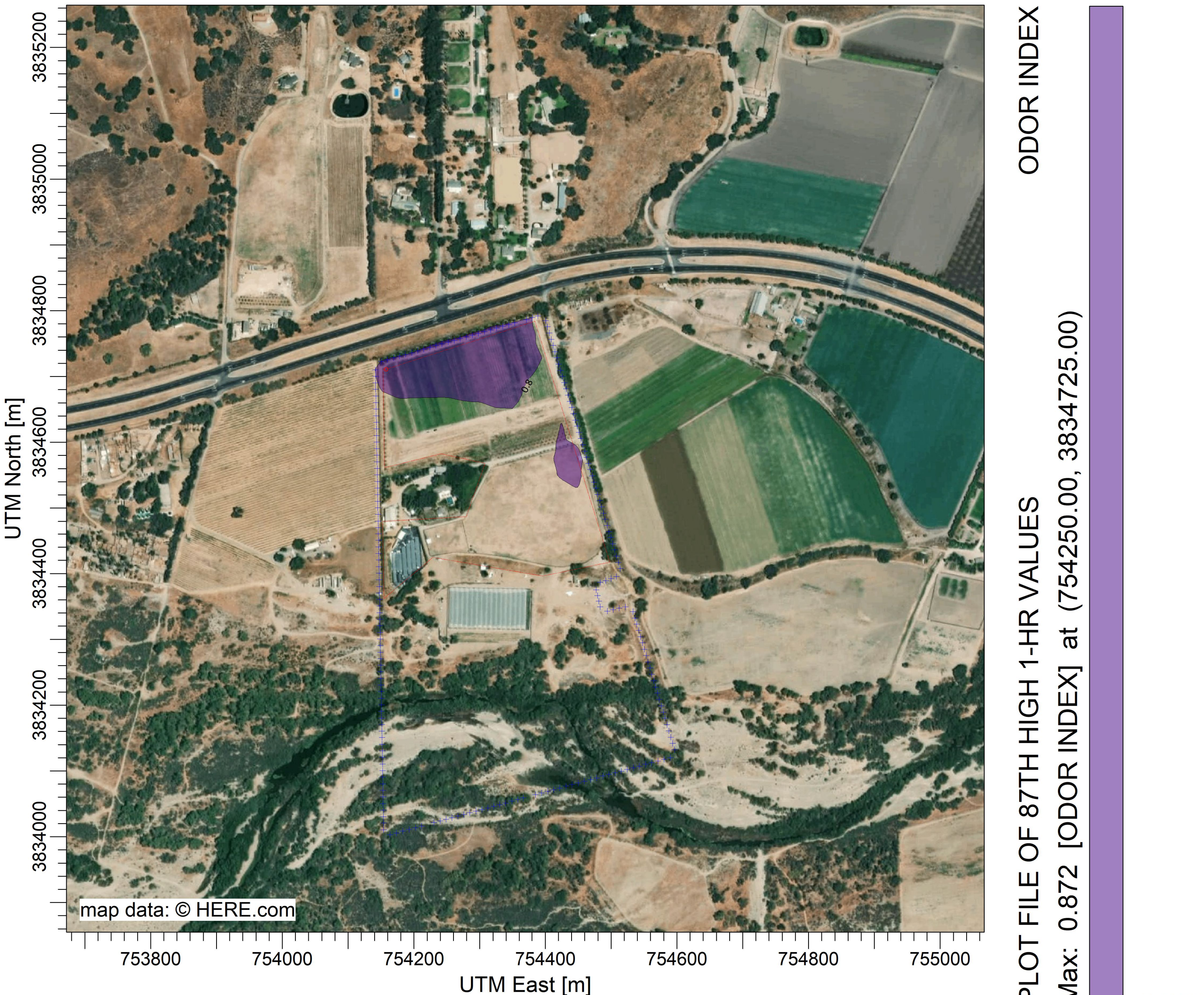
PROJECT NO.:

AERMOD View - Lakes Environmental Software

I:\z_AERMOD\BusyBeeOrganics\BBO_SiteMetData.isc

PROJECT TITLE:

99.8%tile Peak Hour Odor Index
Busy Bee Organics



COMMENTS:

SOURCES:
1

RECEPTORS:
3257

OUTPUT TYPE:
Concentration

NOTICE:
Values are relative.

MODELER:
SDC

DATE:
10/18/2019

SCALE: 1:9,593

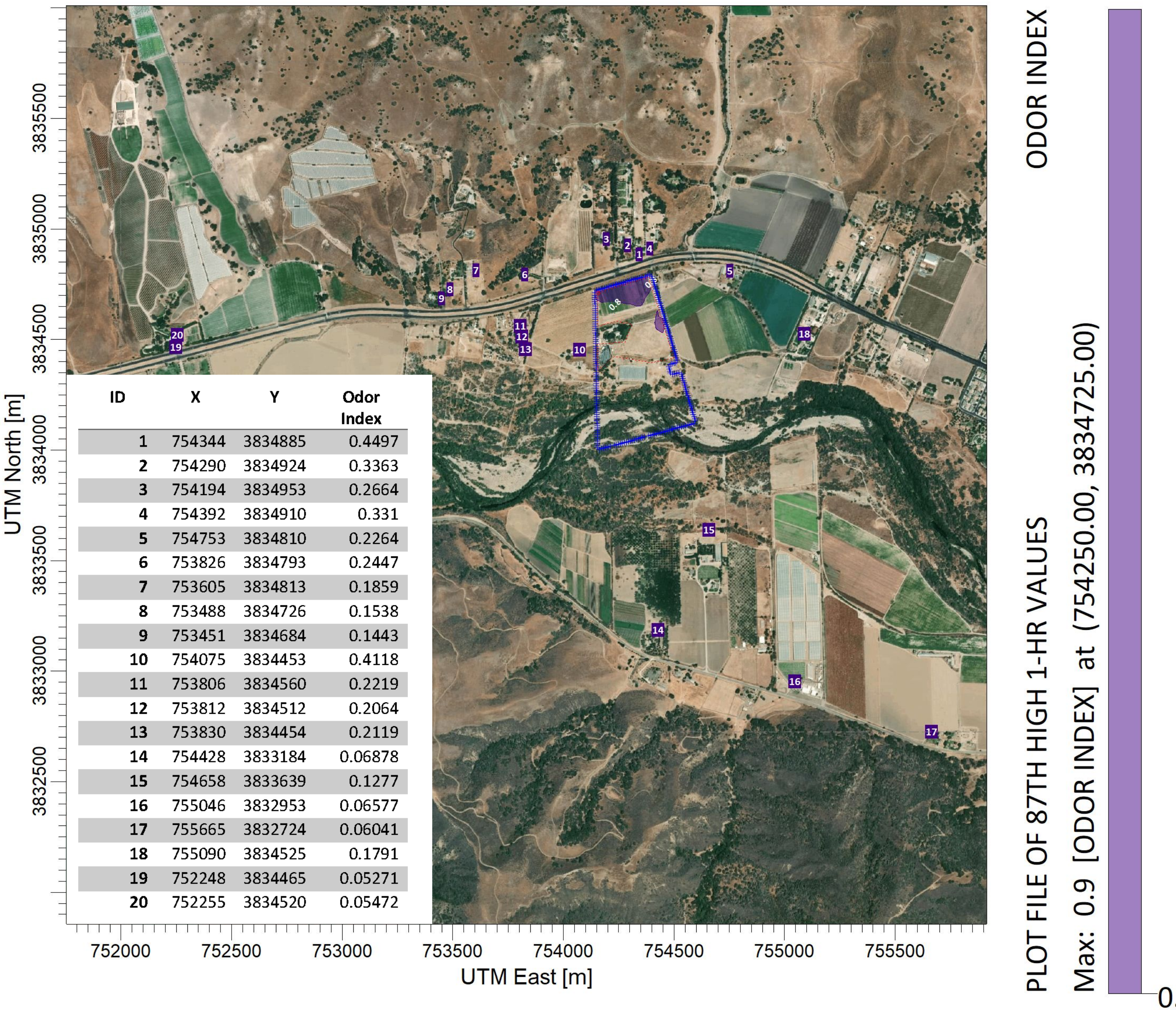
0 — 0.2 km

SESPE CONSULTING, INC.

PROJECT NO.:
BU03.19.01

PROJECT TITLE:

99.8%tile Peak Hour Odor Index
Busy Bee Organics



ID	X	Y	Odor Index
1	754344	3834885	0.4497
2	754290	3834924	0.3363
3	754194	3834953	0.2664
4	754392	3834910	0.331
5	754753	3834810	0.2264
6	753826	3834793	0.2447
7	753605	3834813	0.1859
8	753488	3834726	0.1538
9	753451	3834684	0.1443
10	754075	3834453	0.4118
11	753806	3834560	0.2219
12	753812	3834512	0.2064
13	753830	3834454	0.2119
14	754428	3833184	0.06878
15	754658	3833639	0.1277
16	755046	3832953	0.06577
17	755665	3832724	0.06041
18	755090	3834525	0.1791
19	752248	3834465	0.05271
20	752255	3834520	0.05472

COMMENTS:

Figure 3

SOURCES:

1

RECEPTORS:

3257

OUTPUT TYPE:

Concentration

NOTICE:

Values are relative to the Odor Detection Threshold for the mixture of terpene compounds assessed.

MODELER:

SDC

DATE:

10/18/2019

SCALE: 1:28,286

0 — 0.5 km

SESPE CONSULTING, INC.

PROJECT NO.:

BU03.19.01

ATTACHMENT 2
Meteorological Data

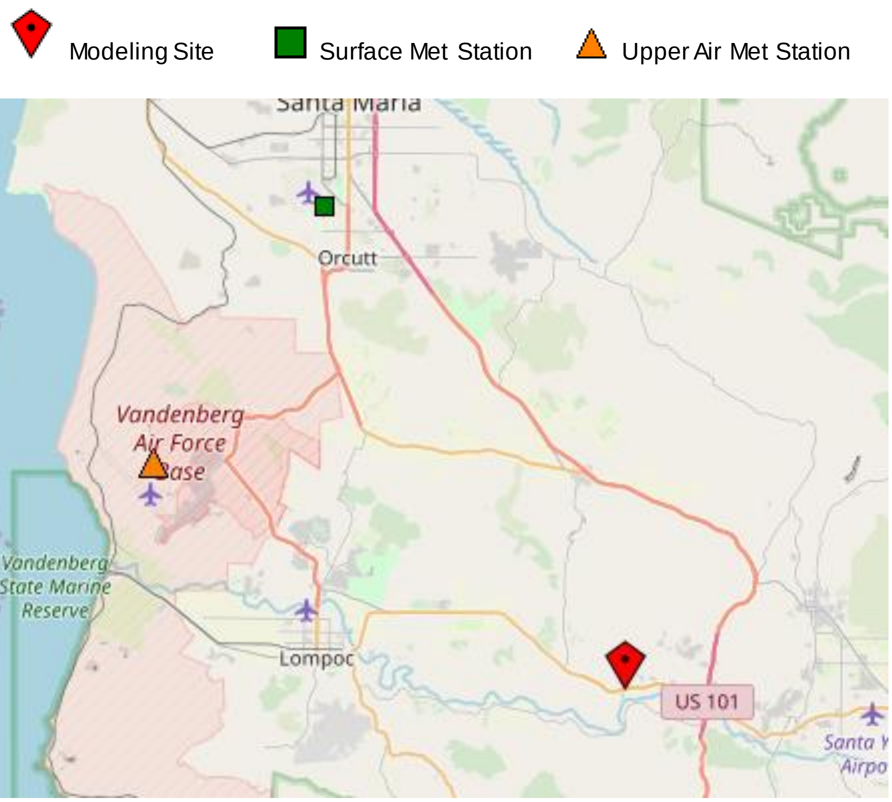
AERMOD-Ready Station Met Data

SFC and PFL Met Data Files

August 1, 2019

Met Data Order Information

Order #	MET1914753
Ordered by	Andre Almeida
Company	Sespe Consulting
Met Data Type	AERMOD-Ready Station Met Data (Surface & Profile Met Data Files)
Start-End Date	Jan 1, 2014 to Dec 31, 2018
Modeling Site Latitude	34.62083 N
Modeling Site Longitude	120.24722 W
Datum	WGS 84
Site Time Zone	UTC/GMT UTC-0800 hour(s)
Closest City & State	Buellton, California - USA



Location of Modeling Site, Surface Station, and Upper Air Station

Lakes Environmental Software
E-mail: sales@webLakes.com
Web: www.webLakes.com

Model Versions Used for Met Data Preprocessing

Parameter	Value
AERMET	Version 18081
AERMINUTE	Version 15272
AERSURFACE	Version 13016

Hourly Surface Station Met Data Information

Parameter	Value
Surface Station Name	SANTA MARIA PUBLIC, CA
Latitude, Longitude	34.89406 N, 120.45216 W
Station ID (WBAN)	23273
ASOS Station?	Yes
File Format	NCDC TD-3505 (ISHD)
Base Elevation	72.5 m
Adjustment to Local Time	8 hours
Anemometer Height	10 m

1-Minute & 5-Minute ASOS Wind Data Information

Parameter	Value
AERMINUTE Data Used?	Yes
Station Name	SANTA MARIA PUBLIC, CA
Latitude, Longitude	34.89406 N, 120.45216 W
Station Code	SMX
Station ID (WBAN)	23273
File Format	NCDC TD-6405
IFW Installation Date	June 6, 2007

Upper Air Station Met Data Information

Parameter	Value
Upper Air Station Name	VANDENBERG, CA
Latitude, Longitude	34.75 N, 120.57 W
Station ID (WBAN)	93214
File Format	FSL
Adjustment to Local Time	8 hours

AERSURFACE Parameters

Parameter	Value
Land Use Data File	USGS NLCD92 – Binary Format
Center Lat/Long	34.89406 N, 120.45216 W
Datum	NAD83
Radius for Surface Roughness	1km
Number of Sectors	12 sectors of 30° (starting at 0°)
Period	Monthly
Surface Moisture	Year 2014: Average Year 2015: Dry Year 2016: Average Year 2017: Average Year 2018: Average
Other Settings	Continuous Snow: No Airport Site: Yes Arid Region: No

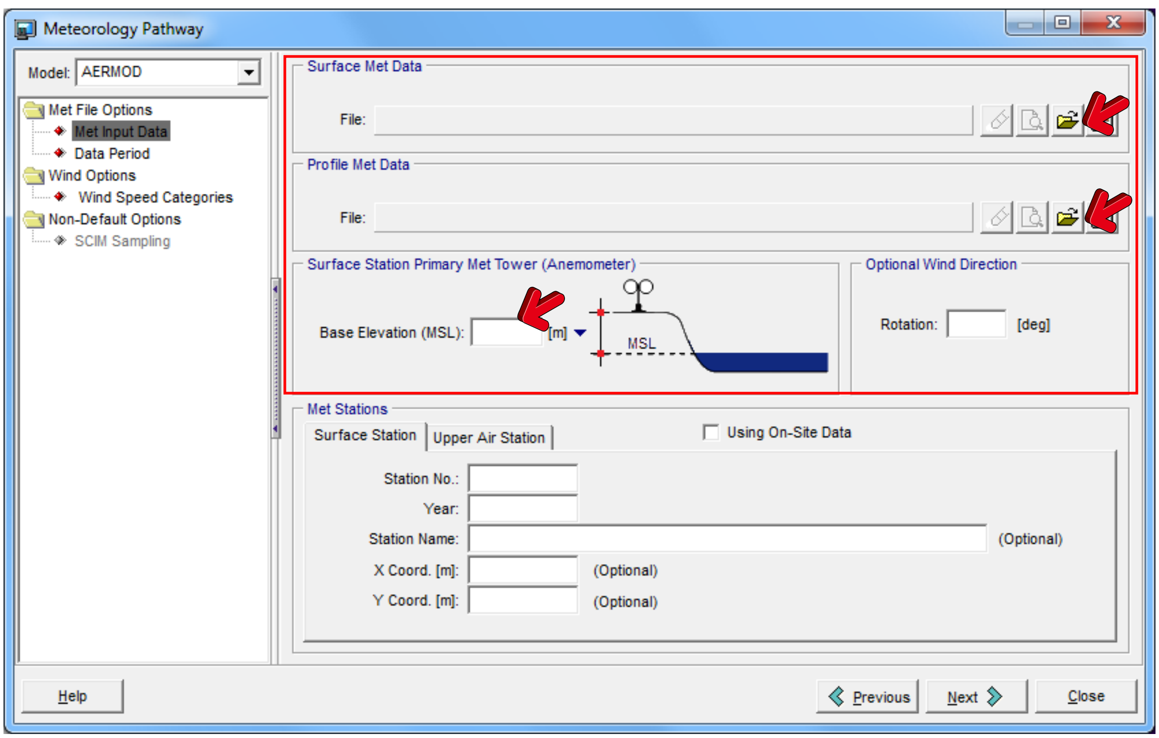
AERMOD View Instructions

Start your **AERMOD View** project and go to the **Meteorology Pathway – Met Input Data** window.

Under the **Meteorology Pathway – Met Input Data** window, specify the Surface Met Data file (*.SFC) and the Profile Met Data file (*.PFL) you received from Lakes Environmental according to table below:

AERMOD Parameters

Parameter	Value
Surface Met Data File	MET1914753_2014_2018.SFC
Profile Met Data File	MET1914753_2014_2018.PFL
Station Base Elevation (MSL)	72.5 m
Surface Station No.	23273
Surface Station Name	SANTA MARIA PUBLIC, CA
Start Year	2014
Upper Air Station No.	93214
Upper Air Station Name	VANDENBERG, CA
Start Year	2014



Lakes Environmental Software
E-mail: sales@webLakes.com
Web: www.webLakes.com

Having Problems?

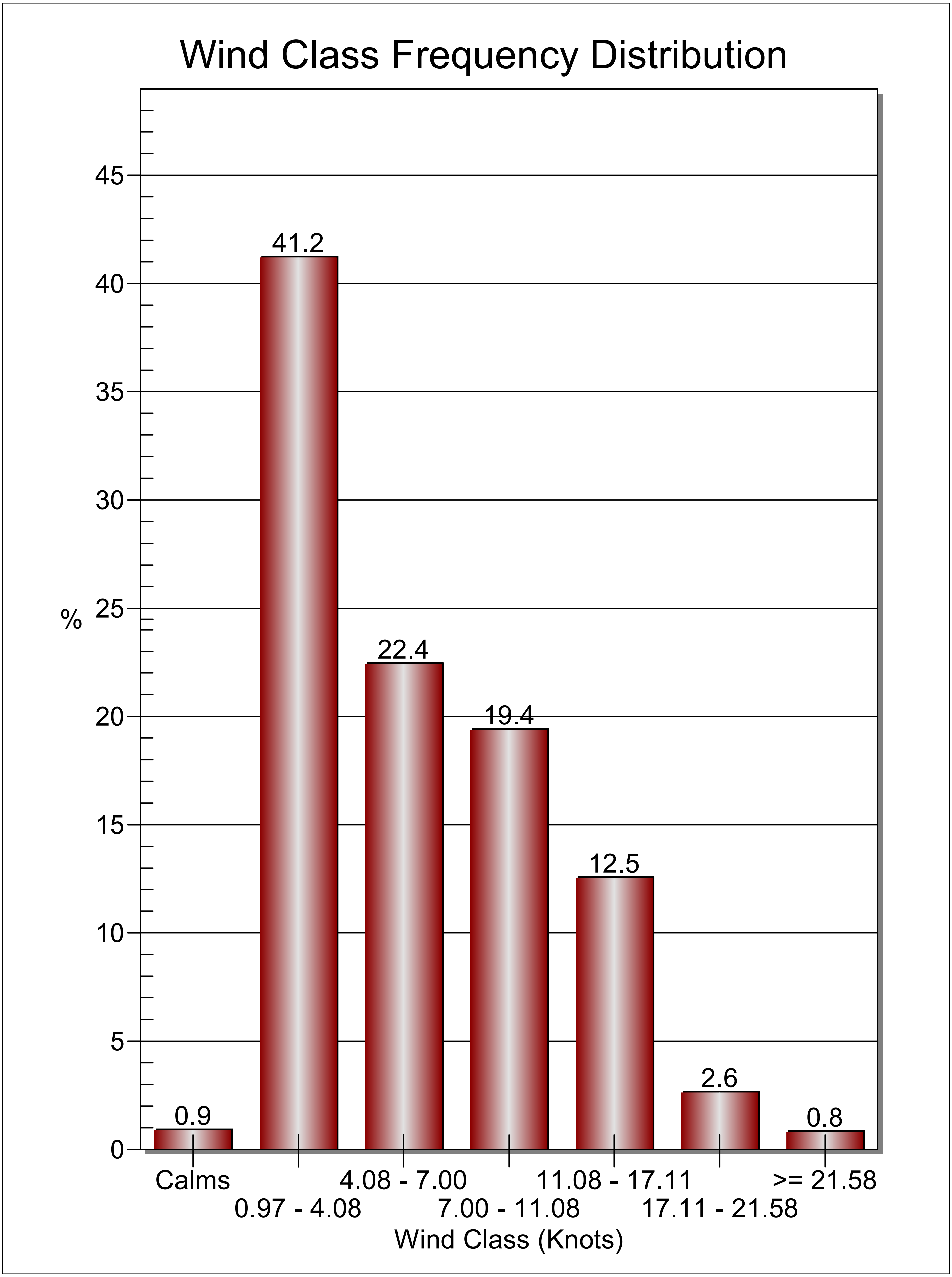
If you have any problems with the met data you received from us or need additional information on the above steps, please do not hesitate to contact us by sending an email to:

sales@webLakes.com

When contacting us, please provide:

- Met data Order # MET1914753
- Detailed description of the problem

Lakes Environmental Software
E-mail: sales@webLakes.com
Web: www.webLakes.com



WRPLOT View 9.6.5 - Lakes Environmental Software

Station ID: 23273 Run ID:
Start Date: 1/1/2014 - 00:00
End Date: 12/31/2018 - 23:59

Frequency Distribution
(Count)

Wind Direction (Blowing From) / Wind Speed (Knots)

	0.97 - 4.08	4.08 - 7.00	7.00 - 11.08	11.08 - 17.11	17.11 - 21.58	>= 21.58	Total
355-5	204	96	93	107	2	0	502
5-15	184	69	99	135	12	0	499
15-25	148	43	69	164	28	0	452
25-35	176	32	61	147	21	0	437
35-45	146	35	42	57	3	0	283
45-55	178	41	19	14	1	0	253
55-65	181	48	10	0	0	0	239
65-75	177	54	11	0	0	0	242
75-85	270	59	6	0	0	0	335
85-95	293	81	2	0	0	0	376
95-105	397	101	12	1	0	0	511
105-115	654	130	12	0	0	0	796
115-125	845	227	18	2	2	0	1094
125-135	1034	243	32	15	1	1	1326
135-145	1064	288	64	43	12	6	1477
145-155	1081	324	96	69	8	1	1579
155-165	977	353	75	91	9	1	1506
165-175	749	274	67	73	12	0	1175
175-185	616	189	70	39	1	0	915
185-195	446	120	53	29	0	0	648
195-205	403	76	30	10	1	0	520
205-215	351	49	21	7	0	0	428
215-225	307	66	33	7	0	0	413
225-235	319	83	52	9	0	0	463
235-245	366	97	87	21	1	0	572
245-255	397	116	132	33	2	0	680
255-265	468	145	107	28	0	0	748
265-275	593	204	102	9	1	0	909
275-285	782	449	138	34	3	0	1406
285-295	901	943	532	386	184	34	2980
295-305	934	1461	1820	1530	661	262	6668
305-315	800	1529	2570	1560	160	40	6659
315-325	613	944	1284	559	11	3	3414
325-335	422	463	382	153	3	0	1423
335-345	320	245	183	76	4	1	829
345-355	254	138	103	83	3	0	581
Total	18050	9815	8487	5491	1146	349	43824

Frequency of Calm Winds: 381
Average Wind Speed: 6.49 Knots

Station ID: 23273 Run ID:
Start Date: 1/1/2014 - 00:00
End Date: 12/31/2018 - 23:59

Frequency Distribution
(Normalized)

Wind Direction (Blowing From) / Wind Speed (Knots)

	0.97 - 4.08	4.08 - 7.00	7.00 - 11.08	11.08 - 17.11	17.11 - 21.58	>= 21.58	Total
355-5	0.004655	0.002191	0.002122	0.002442	0.000046	0.000000	0.011455
5-15	0.004199	0.001574	0.002259	0.003081	0.000274	0.000000	0.011386
15-25	0.003377	0.000981	0.001574	0.003742	0.000639	0.000000	0.010314
25-35	0.004016	0.000730	0.001392	0.003354	0.000479	0.000000	0.009972
35-45	0.003332	0.000799	0.000958	0.001301	0.000068	0.000000	0.006458
45-55	0.004062	0.000936	0.000434	0.000319	0.000023	0.000000	0.005773
55-65	0.004130	0.001095	0.000228	0.000000	0.000000	0.000000	0.005454
65-75	0.004039	0.001232	0.000251	0.000000	0.000000	0.000000	0.005522
75-85	0.006161	0.001346	0.000137	0.000000	0.000000	0.000000	0.007644
85-95	0.006686	0.001848	0.000046	0.000000	0.000000	0.000000	0.008580
95-105	0.009059	0.002305	0.000274	0.000023	0.000000	0.000000	0.011660
105-115	0.014923	0.002966	0.000274	0.000000	0.000000	0.000000	0.018164
115-125	0.019282	0.005180	0.000411	0.000046	0.000046	0.000000	0.024963
125-135	0.023594	0.005545	0.000730	0.000342	0.000023	0.000023	0.030257
135-145	0.024279	0.006572	0.001460	0.000981	0.000274	0.000137	0.033703
145-155	0.024667	0.007393	0.002191	0.001574	0.000183	0.000023	0.036030
155-165	0.022294	0.008055	0.001711	0.002076	0.000205	0.000023	0.034365
165-175	0.017091	0.006252	0.001529	0.001666	0.000274	0.000000	0.026812
175-185	0.014056	0.004313	0.001597	0.000890	0.000023	0.000000	0.020879
185-195	0.010177	0.002738	0.001209	0.000662	0.000000	0.000000	0.014786
195-205	0.009196	0.001734	0.000685	0.000228	0.000023	0.000000	0.011866
205-215	0.008009	0.001118	0.000479	0.000160	0.000000	0.000000	0.009766
215-225	0.007005	0.001506	0.000753	0.000160	0.000000	0.000000	0.009424
225-235	0.007279	0.001894	0.001187	0.000205	0.000000	0.000000	0.010565
235-245	0.008352	0.002213	0.001985	0.000479	0.000023	0.000000	0.013052
245-255	0.009059	0.002647	0.003012	0.000753	0.000046	0.000000	0.015517
255-265	0.010679	0.003309	0.002442	0.000639	0.000000	0.000000	0.017068
265-275	0.013531	0.004655	0.002327	0.000205	0.000023	0.000000	0.020742
275-285	0.017844	0.010246	0.003149	0.000776	0.000068	0.000000	0.032083
285-295	0.020560	0.021518	0.012139	0.008808	0.004199	0.000776	0.067999
295-305	0.021313	0.033338	0.041530	0.034912	0.015083	0.005978	0.152154
305-315	0.018255	0.034890	0.058644	0.035597	0.003651	0.000913	0.151949
315-325	0.013988	0.021541	0.029299	0.012756	0.000251	0.000068	0.077903
325-335	0.009629	0.010565	0.008717	0.003491	0.000068	0.000000	0.032471
335-345	0.007302	0.005591	0.004176	0.001734	0.000091	0.000023	0.018917
345-355	0.005796	0.003149	0.002350	0.001894	0.000068	0.000000	0.013258
Total	0.411875	0.223964	0.193661	0.125297	0.026150	0.007964	0.988910

Frequency of Calm Winds: 0.87%
Average Wind Speed: 6.49 Knots

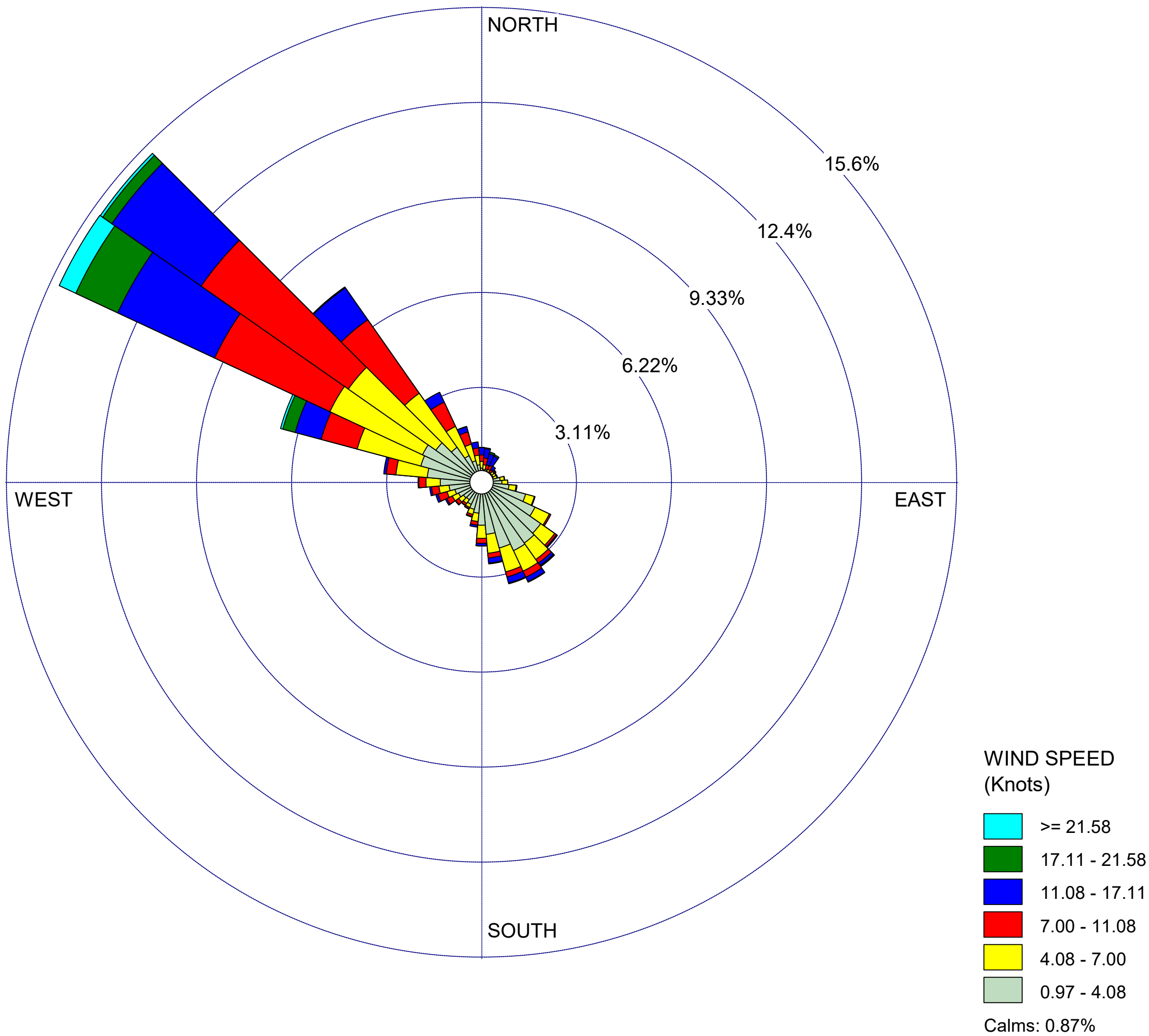
WIND ROSE PLOT:

Busy Bee Organics

MM5 Wind Data (WGS 84 : 34.62083 N, 120.24722 W)

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

DATA PERIOD:

Start Date: 1/1/2014 - 00:00
End Date: 12/31/2018 - 23:59

COMPANY NAME:

MODELER:

SESPE CONSULTING, INC.

CALM WINDS:

0.87%

TOTAL COUNT:

43719 hrs.

AVG. WIND SPEED:

6.49 Knots

DATE:

8/4/2019

PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Wind Direction	0.00 - 2.62	>= 2.62	Total
348.75 - 11.25	544	1,018	1,562
11.25 - 33.75	145	862	1,007
33.75 - 56.25	154	459	613
56.25 - 78.75	189	385	574
78.75 - 101.25	259	648	907
101.25 - 123.75	433	1,524	1,957
123.75 - 146.25	563	2,668	3,231
146.25 - 168.75	621	2,665	3,286
168.75 - 191.25	590	1,436	2,026
191.25 - 213.75	471	637	1,108
213.75 - 236.25	370	658	1,028
236.25 - 258.75	427	1,009	1,436
258.75 - 281.25	501	1,787	2,288
281.25 - 303.75	568	8,792	9,360
303.75 - 326.25	440	10,818	11,258
326.25 - 348.75	232	1,846	2,078
Sub-Total:	6,507	37,212	43,719
Calms:			0
Missing/Incomplete:			105
Total:			43,824

Hours in Two Month Flowering Period:	1,084.5
Hours in Dataset:	43,719
Hours with Conditions Adverse to Inversion or Outside the Two Months Flowering Period:	97.5%

ATTACHMENT 3
Model Input File

(Download model output and other files at: https://www.dropbox.com/sh/82ihcrr8o3bqijs/AAAWXAhBYCjNnLucLteF4eb-a?dl=0).

```
**
****************************************
**
** AERMOD Input Produced by:
** AERMOD View Ver. 9.8.0
** Lakes Environmental Software Inc.
** Date: 10/18/2019
** File: I:\z_AERMOD\BU03-BusyBeeOrganics\BBO_SiteMetData(3)\BBO_SiteMetData.inp
**
****************************************
**
**
****************************************
** AERMOD Control Pathway
****************************************
**
**
CO STARTING
   TITLEONE BusyBeeOrganics
   TITLETWO Lompoc H Street MetData
   MODELOPT DFAULT CONC
   AVERTIME 1 PERIOD
   POLLUTID ODOR
   RUNORNOT RUN
   SAVEFILE I:\z_AERMOD\BU03-BusyBeeOrganics\BBO_SiteMetData(3)\BBO_SiteMetData.sv1 5
   ERRORFIL BBO_SiteMetData.err
CO FINISHED
**
****************************************
** AERMOD Source Pathway
****************************************
**
**
SO STARTING
** Source Location **
** Source ID - Type - X Coord. - Y Coord. **
   LOCATION PAREA1       AREAPOLY   754157.477  3834711.136       98.200
** Source Parameters **
   SRCPARAM PAREA1       1.9477E-06     1.500        12     3.000
   AREAVERT PAREA1       754157.477 3834711.136 754384.427 3834784.312
   AREAVERT PAREA1       754497.902 3834417.373 754396.093 3834396.163
   AREAVERT PAREA1       754228.531 3834424.796 754154.295 3834362.226
   AREAVERT PAREA1       754152.174 3834479.943 754279.436 3834487.367
   AREAVERT PAREA1       754308.070 3834567.966 754241.257 3834582.813
   AREAVERT PAREA1       754155.356 3834561.603 754153.235 3834711.136
   SRCGROUP ALL
SO FINISHED
**
****************************************
** AERMOD Receptor Pathway
****************************************
**
**
RE STARTING
   INCLUDED BBO_SiteMetData.rou
RE FINISHED
**
****************************************
** AERMOD Meteorology Pathway
****************************************
**
**
ME STARTING
** Surface File Path: I:\z_AERMOD\BU03-BusyBeeOrganics\BBO_SiteMetData(3)\
   SURFFILE MET1914753_2014_2018.SFC
** Profile File Path: I:\z_AERMOD\BU03-BusyBeeOrganics\BBO_SiteMetData(3)\
```

```
   PROFFILE MET1914753_2014_2018.PFL
   SURFDATA 23273 2014
   UAIRDATA 93214 2014
   PROFBASE 72.5 METERS
ME FINISHED
**
****************************************
** AERMOD Output Pathway
****************************************
**
**
OU STARTING
   RECTABLE ALLAVE 1ST-10TH 87
   RECTABLE 1 1ST-10TH 87
** Auto-Generated Plotfiles
   PLOTFILE 1 ALL 1ST
   I:\z_AERMOD\BU03-BusyBeeOrganics\BBO_SiteMetData(3)\BBO_SITEMETDATA.AD\01H1GALL.PLT 31
   PLOTFILE 1 ALL 2ND
   I:\z_AERMOD\BU03-BusyBeeOrganics\BBO_SiteMetData(3)\BBO_SITEMETDATA.AD\01H2GALL.PLT 32
   PLOTFILE 1 ALL 3RD
   I:\z_AERMOD\BU03-BusyBeeOrganics\BBO_SiteMetData(3)\BBO_SITEMETDATA.AD\01H3GALL.PLT 33
   PLOTFILE 1 ALL 4TH
   I:\z_AERMOD\BU03-BusyBeeOrganics\BBO_SiteMetData(3)\BBO_SITEMETDATA.AD\01H4GALL.PLT 34
   PLOTFILE 1 ALL 5TH
   I:\z_AERMOD\BU03-BusyBeeOrganics\BBO_SiteMetData(3)\BBO_SITEMETDATA.AD\01H5GALL.PLT 35
   PLOTFILE 1 ALL 6TH
   I:\z_AERMOD\BU03-BusyBeeOrganics\BBO_SiteMetData(3)\BBO_SITEMETDATA.AD\01H6GALL.PLT 36
   PLOTFILE 1 ALL 7TH
   I:\z_AERMOD\BU03-BusyBeeOrganics\BBO_SiteMetData(3)\BBO_SITEMETDATA.AD\01H7GALL.PLT 37
   PLOTFILE 1 ALL 8TH
   I:\z_AERMOD\BU03-BusyBeeOrganics\BBO_SiteMetData(3)\BBO_SITEMETDATA.AD\01H8GALL.PLT 38
   PLOTFILE 1 ALL 9TH
   I:\z_AERMOD\BU03-BusyBeeOrganics\BBO_SiteMetData(3)\BBO_SITEMETDATA.AD\01H9GALL.PLT 39
   PLOTFILE 1 ALL 10TH
   I:\z_AERMOD\BU03-BusyBeeOrganics\BBO_SiteMetData(3)\BBO_SITEMETDATA.AD\0110GALL.PLT 40
   PLOTFILE 1 ALL 87
   I:\z_AERMOD\BU03-BusyBeeOrganics\BBO_SiteMetData(3)\BBO_SITEMETDATA.AD\01H87GALL.PLT 41
   PLOTFILE PERIOD ALL
   I:\z_AERMOD\BU03-BusyBeeOrganics\BBO_SiteMetData(3)\BBO_SITEMETDATA.AD\PE00GALL.PLT 42
   SUMMFILE I:\z_AERMOD\BU03-BusyBeeOrganics\BBO_SiteMetData(3)\BBO_SiteMetData.sum
OU FINISHED
**
****************************************
** Project Parameters
****************************************
** PROJCTN  CoordinateSystemUTM
** DESCPTN  UTM: Universal Transverse Mercator
** DATUM    World Geodetic System 1984
** DTMRGN   Global Definition
** UNITS    m
** ZONE     10
** ZONEINX  0
**
```

ATTACHMENT 4
Sespe Staff Resumes
And Project Briefs

SESPE CONSULTING, INC.
1565 Hotel Circle South, Ste. 370 • San Diego, California 92108
Office: (619) 894-8669 Fax: (805) 667-8104

Andre Almeida, P.E.
Engineer II
aalmeida@sespe.com

EDUCATION

UNIVERSITY OF CALIFORNIA, SAN DIEGO — La Jolla, CA
B.S., Chemical Engineering — 2016

WORK HISTORY

SESPE CONSULTING, INC. — San Diego, CA
Engineer I, Engineer II — September 2016 – Present

UNIVERSITY OF CALIFORNIA, SAN DIEGO, FACILITIES MANAGEMENT — San Diego, CA
Energy Management Systems Engineer — January 2016 – September 2016

ALLIANCE TO SAVE ENERGY — San Diego, CA
Project Manager — February 2013 – December 2015

SCRIPPS INSTITUTION OF OCEANOGRAPHY — San Diego, CA
Thermodynamics Engineering Consultant — April 2013 – January 2014

EXPERIENCE

AIR QUALITY

Experience in modeling air pollutant diffusion from industrial projects and preparation of technical reports. Familiarity with applicable federal, state, and county guidance for air quality modeling, including guidance from 6+ California air districts.

Prepared air dispersion models using AERMOD and assessed health risk using CARB HARP software for many projects and purposes including as part of air permitting and CEQA impact analysis.

Proficiency writing Health Risk Assessments for CEQA Environmental Impact Reports that involve calculations of:

- The pollution output levels of facility devices;
- Resulting ground level concentrations of pollutants at various receptors;
- Health impact to receptors, including;
    - Acute impact,
    - Chronic impact,
    - Long term cancer risk.

Prepared various compliance reporting documents and provided consultation related to compliance issues. Specifically, emissions inventory (GHG, criteria and air toxics) protocols and reporting; violation response and negotiation, and annual compliance certifications/renewals.

Computational Modeling

Experience modeling natural and industrial systems, including:

- Health risk assessment and criteria pollutant modeling using software including AERMOD, HARP2, and CalEEMod;
- Industrial project toxics, criteria pollutant, and GHG emissions estimating using CalEEMod software;
- Developing and implementing energy use optimization models for high energy use industrial equipment, including HVAC equipment, lab fume hoods, -80°C freezers ; and
- Preparing energy production potential calculations and reports on geological heat flow.

Data Science, Software Development, and Automation

Scripting Experience in the following languages:

Python (specialization in “NumPy” and “PANDAS” Modules)
Visual Basic for Applications (VBA)
Matrix Laboratory (MATLAB)

Successful design, production, and implementation of software for:

- Automated dataset analysis and manipulation;
- health risk assessment modeling; and
- stormwater chemical compliance assessment.

Energy Auditing and Optimization

Experience analyzing office, laboratory, and industrial spaces and providing recommendations for reducing energy use and increasing efficiency, including:

- Behavioral changes;
- Process adjustments;
- Retrofits.

Industrial Hygiene

Experience in worker health and safety including:

- Sampling for Silica and Noise in mining environments;
- Conducting assessments of employee exposure to hazardous materials during industrial operations; and
- Providing safety training to lab occupants working with volatile reagents in a lab setting.

REGISTRATIONS AND CERTIFICATIONS

Registered Chemical Engineer: California CH6933

SESPE CONSULTING, INC.

1565 Hotel Circle South, Ste. 370 • San Diego, California 92108
Office: (619) 894-8670 • Fax: (805) 667-8104

Scott D. Cohen, P.E., C.I.H.
Principal Engineer
scohen@sespe.com

EDUCATION

UNIVERSITY OF CALIFORNIA, SANTA BARBARA — Santa Barbara, CA
B. S. Mechanical Engineering — June 1993

WORK HISTORY

SESPE CONSULTING, INC. — Ventura, CA; San Diego, CA
Principal Engineer — May 2019 – Present
Project Manager III — June 2009 – May 2019

COUNTY OF SAN DIEGO. — San Diego, CA
Air Pollution Control District Hearing Board Member — September 2014 – September 2018

WEST COAST ENVIRONMENTAL AND ENGINEERING — Ventura, CA; San Diego, CA
Managing Engineer — 1996 – May 2009

LOS ALAMOS NATIONAL LABORATORY — Los Alamos, NM
Hazardous Waste Technician IV — 1994 – 1995
Graduate Research Assistant, Hydrology Group — 1993 – 1994

Recent work history includes:

- Provision of EH&S permitting and compliance services for industrial and municipal clientele.
- Management of southern California branch office(s) and staff including acquisition of office space, furniture, equipment, and consumables; installation and maintenance of network infrastructure and information systems; human resource functions such as hiring, firing, and policy enforcement; transitional duties during acquisition of another small consulting company; and interface with property manager(s).
- Management of multiple, simultaneous consulting projects of various sizes, durations, locations, complexities, and subject matter. Tasks include proposal scoping, costing, writing and interviewing; primary contact for client, agency staff and other stakeholders; budget and schedule tracking; invoice preparation and distribution.
- Interpretation and tracking of regulatory, planning and legal developments and documentation to identify potential opportunities and challenges; ensure that work product is prepared using the most current and defensible method available; and illuminate alternative and/or novel approaches that may be implemented.
- Marketing through active participation in various associations and other groups including volunteering to serve as chair, secretary, host, or another role in committees and for meetings; public speaking, booth attendance, and entertainment of clients during conferences; writing articles for trade journals; and donation of professional services as may be needed to track issues, attend meetings, strategize and communicate when an undesirable restriction has been proposed.

- Using and learning to use computers to most efficiently accomplish work at-hand including specialized software (e.g., AERMOD, HARP, EMFAC, CalEEMod, GIS, RTNM, SoundPlan, AggFlow); office productivity software (e.g., Word, Excel, Access, VBA); graphics software (e.g., Photoshop/Illustrator, 2D CAD, etc.); networking software (e.g., LAMP stack).
- Technical support and process development for publishing large environmental documents (EIRs).
- Core skill set includes:
  - Project Management
  - Technical Writing
  - Air Quality and Greenhouse Gases
  - Noise and Vibration
  - CEQA/NEPA
  - Dispersion Modeling and Health Risk Assessment
  - Construction and Mining
  - Industrial Hygiene

EXPERIENCE

Technical Analysis for CEQA/NEPA and Special Studies

- Practiced in the subject areas of air quality, health risk assessment, climate change, noise, vibration, and hazardous materials. Emphasis in assessing fugitive dust and diesel exhaust.
- Applied CEQA requirements in light of existing case law to assess baseline, cumulative effects, and project fair share of mitigation for cumulative effects.
- Developed feasible, enforceable mitigation measure language including some creative solutions.
- Successfully defended work-product through litigation of several project EIRs by supporting efforts of legal counsel in the analysis of opposition arguments and the development counter arguments.
- Experienced a variety of project types including mining, asphalt, ready mix concrete, residential/commercial developments, arterial-freeway interchange improvements, and a university long range development plan.

Industrial Environmental Compliance and Permitting

- Involved in most aspects of environmental compliance for industrial clients including development of management systems and policy.
- Permitted air emissions sources in local and federal (Title V) programs including all aspects of new source review, emissions calculations and modeling, health risk assessment, best available control technology (BACT) cost effectiveness, and portable equipment regulation.
- Permitted industrial process water discharge to land under National Pollutant Discharge Elimination System (NPDES) and to sewer.

- Prepared storm water pollution prevention plans (SWPPP) and related documents including notices of intent, annual reports, and notification to regional water board of illicit discharges.
- Performed services related to characterization and management of hazardous materials and wastes including:
  - Release investigation and sampling.
  - Storage, use and transport as regulated by EPA, OSHA, DOT and the Uniform Fire Code.
  - Risk management plans (RMPs) for facilities with acutely hazardous material.
  - Emergency response plans and spill pollution control and countermeasures (SPCC) plans for facilities with bulk petroleum storage.

Air Quality Expertise

- Prepared air permit applications and negotiated conditions on permits to construct and operate various types of sources and facilities (including those in Title V) in each major California air district, some smaller districts, and several states. Work included each facet of new source review including cost effectiveness and feasibility for BACT, offsets, modeling and coordination of start-up/initial source testing.
- Prepared air dispersion models using AERMOD and assessed health risk using CARB HARP software for many projects and purposes including as part of air permitting and CEQA impact analysis.
- Represented California Mining Association and provided consultation to Arizona Rock Products Association during fugitive dust rulemaking in South Coast AQMD (Rule 1157) and Maricopa County (Rule 316).
- Prepared various compliance reporting documents and provided consultation related to compliance issues. Specifically, emissions inventory (GHG, criteria and air toxics) protocols and reporting; violation response and negotiation, and annual compliance certifications/renewals under Title V.

Worker Safety and Industrial Hygiene

- Provided regulatory analysis and technical support to clients with issues in the areas of indoor air quality (IAQ) and other employee exposure investigations.
- Process hazard analysis, injury and illness prevention (IIPP), safety program management, OSHA violation response, employee training, hazard communication (HAZCOM), personal protective equipment (PPE) selection, confined space, lockout/tagout, health risk assessment, noise, and fall protection.

REGISTRATIONS AND CERTIFICATIONS

Registered Mechanical Engineer: California M30545

Certified Industrial Hygienist: 8162CP

County of San Diego CEQA Air Quality and Noise Consultant Lists

PUBLISHED ARTICLES AND PRESENTATIONS

California Construction and Industrial Mineral Association Education Conference or Meeting
The Air UP There – Positive Health Impacts from Industry's Investments in Diesel Truck Engines (2018).
Distance Matters – Assessing Regional Air and GHG Impacts of Mining Projects Under CEQA (2015).
Industrial Hygiene Statistics and Exposure Assessment (H&S Committee Meeting, 7/2015).
Navigating the Rocky Road to Portable Permitting in California (2013).
Community Noise Impact Assessment Primer (2011).
Portable Plant Air Permitting, What You Need to Know (2009).
Case Study – CEQA Analysis of Air Quality, Greenhouse Gas, and Health Risk Impacts (2008).

Industrial Environmental Association Education Conference or Meeting
Air Permitting 101 & 102 (2015 & 2016).
California Health Risk Assessment Methodology Changes (Air Committee Meeting, 4/2014).

California Asphalt Magazine
Health Risk Assessment – What to Expect and How to Prepare (July 2017).
Portable Equipment Air Permitting and Compliance Status Update (July 2012).
Can California Afford its Climate Change Policies? (July 2011).

California Precast Concrete Association (CPCA) Member Meeting
Current Air Quality Issues Facing Processors of Non-Metallic Minerals (November 2005).

AFFILIATIONS AND MEMBERSHIPS

California Construction and Industrial Materials Association Member and *Associate of the Year in 2015*

California Asphalt Pavement Association Environmental Committee Co-chair (2010 to present)

Industrial Environmental Association Member

Industrial Minerals Association of North America Member

American Industrial Hygiene Association Member

San Diego APCD Air Pollution Permit Streamlining Committee/Compliance Improvement Team (APPS/CIT) Meeting Chair (7/2012 to 7/2017)

SESPE CONSULTING, INC.
374 Poli St., Ste. 200 • Ventura, California 93001
Office: (805) 275-1515 Fax: (805) 667-8104

Rob Dal Farra, P.E.
Vice President
rdalfarra@sespe.com

EDUCATION

UNIVERSITY OF WINDSOR, — Windsor, Ontario, Canada
BASc, Chemical Engineering — 1981

REGISTRATIONS

- Professional Engineer, Chemical Engineering, California (#CH005847)
- South Coast Air Quality Management District Certified Permitting Professional (#B4317)

WORK HISTORY

SESPE CONSULTING, INC. — Ventura, CA
Vice President — Present

- Provide executive management and company quality assurance/quality control.
- Develop work product methodologies, procedures and formats for numerous company services including site assessment, regulatory compliance, hazardous materials, hazardous waste, etc.
- Hiring, training, developing, and managing junior staff.
- Client management.
- Project management including scheduling, coordination, budgeting, and quality control.

EXPERIENCE

35 years of professional experience including 30 years of wide ranging consulting experience covering all aspects of environmental compliance, assessment and management.

INDUSTRY EXPERIENCE

- Provided consulting services to a wide variety of industries, including:
  - Aggregate mining and processing
  - Ready mixed and asphaltic concrete production
  - Crude oil production and processing
  - Refined oil bulk storage, blending and distribution
  - Scrap metal recycling
  - Metal forging and forming
  - Food processing and agricultural
  - Water purveyors
  - Semiconductor manufacturing
  - Real estate development
  - Power generation
  - Glass production

WATER QUALITY

- National Pollutant Discharge Elimination System (NPDES) and Waste Discharge Requirements (WDR) permitting, monitoring, reporting and compliance support including evaluation of technical issues such as ion imbalance toxicity and mixing zones.
- Discharge treatment studies for various manufacturing facilities, in particular ion exchange pilot testing for removal of toxic metals to meet CTR/NPDES permit limits for inland surface waters.
- Industrial sewer discharge support including preparing baseline monitoring reports, obtaining local sewer permits, Notice of Violation (NOV) resolution and treatment system evaluations.
- Preparation of Storm Water Pollution Prevention Plans (SWPPPs) for a variety of industrial and manufacturing facilities.

SITE ASSESSMENT AND ENVIRONMENTAL AUDITS

- Completed environmental compliance audits for numerous manufacturing operations including construction materials, wastepaper recycling, circuit board manufacturing, electronics equipment manufacturing, and bottled water production.
- Conducted pre-acquisition due diligence compliance audits for aggregate mining, ready mixed and asphaltic concrete production facilities.
- Provided project management for more than 1,000 Phase I Site Assessment projects including agricultural parcels, heavy and light manufacturing sites, oil and gas production facilities, and commercial and residential lands.

HAZARDOUS MATERIALS

- Hazard Communication Program development and implementation including conducting hazardous material audits and creating MSDS tracking and reporting systems.
- Hazardous Material Business Plan preparation and Tier II reporting.
- Prepared and/or certified Spill Prevention Control and Countermeasure (SPCC)
- Prepared Facility Response Plans for large oil blending and packaging facilities.
- Prepared Toxic Release Inventory (TRI) reports for a variety of manufacturing facilities and reported emissions using Form R/Form A.
- Risk Management Plan (RMP) preparation for facilities storing anhydrous ammonia and chlorine gas.
- Facility design support for California Fire Code (CFC) and California Building Code (CBC) requirements.

HAZARDOUS WASTE

- Hazardous waste compliance support.
- Waste Minimization (SB14) Plan and Report preparation.
- California Tiered Permitting support including preparation of necessary reporting forms, developing closure cost estimates, and certifying hazardous waste treatment tanks and containment areas.

LAND USE PLANNING AND PERMITTING

- Conditional Use Permitting (CUP) support
- Managing the preparation of technical studies in support of environmental impact reports
- Permitting of new crude oil wells and production facilities

Project: Azusa Rock Quarry Expansion Project EIR

Air Quality and Climate Change Studies and Subsequent Litigation Support

Dates: 2006 to 2011

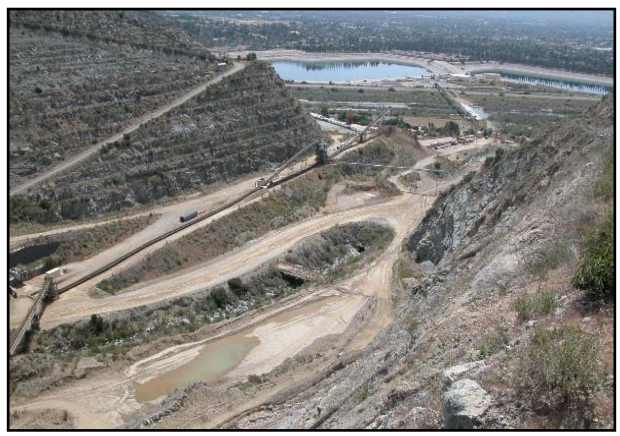
Client: Vulcan Materials Company – Western Division

Location: City of Azusa

Contract Value: $ 150,000

Contact: Jim Gore, Permitting and Government Relations
323.474.3231
gorej@vmcmail.com

Description: Vulcan Materials Company was proposing to increase mining from approximately 1.5 million tons per year (MTPY) to an estimated 10.8 MTPY and increase material processing, which required amending the existing Reclamation Plan and Conditional Use Permit, and preparing an Environmental Impact Report (EIR). SESPE employees, while at another firm, were hired to prepare stand-alone technical reports in support of the EIR. This effort included developing impact reduction strategies and creating Project Design Features that were incorporated into the project to reduce potentially significant impacts to air quality.



The Project sought to process up to 6 MTPY at a rate of 50 percent above the average day on the peak day in a 312-day year (i.e. 28,800 tons per day on the peak day). This peak day amount coincided with the maximum throughput that could be processed by mining equipment and haul trucks that load the processing plant as determined by cycle time analysis for the process. Peak day assumptions are important because they are used to estimate regional air quality impacts in the South Coast Air Quality Management District.

Distinctive Characteristics: Several distinctive characteristics are associated with the Azusa Rock Quarry. Two residential neighborhoods are located within one and one-half miles from the site. The northern quarry boundary is adjacent to the Angeles National Forest. Reclamation included a new process known as “micro benching” that will allow for native vegetation to be planted in benches on the previously mined slopes thereby integrating the facility with the surrounding topography.

Outcome: Project Design Features were successfully developed that were incorporated in the EIR, which eliminated the need to develop mitigation measures.

SESPE CONSULTING, INC.

www.SespeConsulting.com

Ventura 805.275.1515
San Diego 619.894.8669

Project: Lebata Big Rock Creek Project Surface Mine Reclamation Plan and EIR Air Quality and Climate Change Impact Assessments

Dates: 2004-2014

Client: McGee and Associates

Location: Los Angeles County, CA

Contract Value: ≈ $150,000

Contact: Jim McGee, Esq.
McGee and Associates
949.640.0050
jimmcgee@mcgee-law.com

Description: A newly proposed mine, this project involves mining approximately 275 acres of a 310-acre site over a 50-year permit period. Approximately 42.3 million gross tons of sand and gravel would be excavated in two phases at an extraction rate ranging from 0.5 million and 2.5 million tons per year. In addition to aggregate surface mining and processing facilities, the project would include a ready-mixed concrete plant, a Vac-Lite plant (producing lightweight concrete), an asphalt mixing plant, a raw cement and aggregate transfer and distribution facility (via existing rail), and water reclamation and fines recovery facilities. The reclaimed end use for disturbed lands would be open space/groundwater recharge and/or stormwater retention basins. Beginning with a previous employer, SESPE staff members have been working on this project since 2004. Lebata submitted an application to the County for the Surface Mining Permit and Reclamation Plan in 2007. From 2009 to 2014, regulatory issues and project design changes led to numerous revisions to the Reclamation Plan, the environmental impact report (EIR), and supporting technical studies. SESPE was actively involved in addressing those changes, and circulated a Draft EIR for public review in February 2014.

A - Existing conditions

B - View after proposed facility is installed.

Distinctive Characteristics: At the conclusion of a pre-production phase of mining (up to 5 years), the project facilities pad would be about 25 to 35 feet below surrounding natural grade and thus shielded to reduce noise and to minimize visibility of processing facilities and off-site lighting impacts. In addition to minimizing distance setbacks and maintaining aggregate reserve volume, mining and reclamation phasing are timed so at least 71 percent of the site will be available as undisturbed and/or reclaimed habitat areas at any point in time.

Outcome: The County of Los Angeles certified the Final EIR in 2014 and approved the Draft EIR's "environmentally superior" alternative. SESPE finalized the Reclamation Plan consistent with the County approval.

Terpene drift from *Cannabis sativa* L. (hemp) and the implications for *Vitis vinifera* (wine grapes) planted in close proximity

George Sellu[1],* Marielle Kane[2], James Prendergast[2], Chris Wills[3]

Marielle Kane
CannaCraft,
Santa Rosa, CA

James Prendergast
CannaCraft,
Santa Rosa, CA

Chris Wills
Santa Rosa Junior College,
Santa Rosa, CA

*Corresponding author:
George Sellu, Ph.D.
Santa Rosa Junior College/Professor
1501 Mendocino Avenue, Santa Rosa, CA 95401
707-527-4648
gsellu@santarosa.edu
gssellu@ucdavis.edu

Abstract

Industrial Hemp (*Cannabis sativa* L.) is one of the most versatile agricultural crops in the United States (US). However, until 2018, hemp had not been cultivated on a large scale in the US in over 80 years. With the recent re-authorization of hemp cultivation, the acreage under cultivation has increased tremendously while the knowledge base regarding hemp cultivation practices and interaction with other field crops has remained static. Hemp like other agricultural plants (e.g. *Vitis vinefera*, Eucalyptus, Lavandula, and *Arabidopsis*) produce copious amounts of volatile organic compounds (VOCs) such as terpenes. There are concerns about hemp VOCs tainting other agricultural crops. In this study, we examined the potential of hemp terpenes in tainting wine grapes planted in close proximity to a hemp field. Wine grape samples were collected from the vineyard over a five-week period when both the hemp plants and wine grapes were nearing harvest. Overall, the hemp plants contained high levels of terpenes. However, using a headspace GC-MS, there were no detectable levels of hemp terpenes on the wine grapes or the resultant wine made from the vineyard in this study. While the findings of this study are significant, we believe that more research is warranted to fully understand how other variables could influence hemp terpene emission and potential wine grape taint.

Introduction

Cannabis sativa L. (hemp) is one of the oldest sources of food, textile fibres, medicine, building materials, and paper. Industrial hemp is typically a dioecious plant, and it is one of the two most popular plants in the *Cannabaceae* family. Breeders have recently developed monoecious cultivars of industrial hemp that are suitable for producing dual- or tri-crops (fibres, seeds, and oil). Because of its myriad uses, hemp has become an economically viable crop for farmers across the world. Hemp was outlawed in the United States (US) in the mid 1930s after the adoption of the Uniform State Narcotic Drug Act, which was aimed at regulating cannabis (marijuana). However, over the past eight decades, researchers and breeders outside of the US have continued working on understanding hemp's chemical composition and secondary uses. The Agricultural Act of 2014 (Federal Farm Bill) established guidelines for farmers to partner with higher education institutions to cultivate hemp for research purposes. However, it failed to support the commercial cultivation of hemp, which, at that time, was still considered to be a scheduled drug. The Agriculture Improvement Act of 2018 (Farm Bill) reclassified hemp as an agricultural commodity and hence legalized commercial cultivation across the US. With the de-scheduling of hemp, there has been increased interest in its cultivation as a crop with a high dollar value.

Prior to the Marijuana Tax Act of 1937, US farmers cultivated hemp primarily for fibre. There was therefore little knowledge or interest in hemp cultivated for cannabidiol (CBD) in the US. Between 1937 and 2014, hemp cultivation was illegal in the US, and domestic research on this crop was dormant during this period. However, European nations have been able to conduct extensive research on hemp, and over the last century, they have developed both CBD and fibre varieties. The hemp research projects that were implemented as a result of the 2014 Farm Bill have led to a better understanding of effective cultivation and management practices for hemp across the US. However, there is still a lack of knowledge regarding hemp cultivation and processing in the US. Furthermore, there is limited research related to the chemical composition of hemp compounds and their uses.

There are three main phytochemical classes of hemp extract: cannabinoids, terpenes, and phenolic compounds[17]. In recent years, there has been a keen focus on the medicinal benefits of hemp CBD. Medicinal cannabis has been touted for the health benefits associated with CBD and delta-9-tetrahydrocannabinol (THC). The US Food and Drug Administration (FDA) distinguishes hemp from marijuana based on the content of THC, a psychoactive compound. In the US, hemp is described as a plant from the *Cannabaceae* family that is rich in non-psychoactive cannabinoids, with less than 0.3% of THC, while cannabis plants with a THC content greater than or equal to 0.3% are classified as marijuana.

Although hemp has been de-scheduled and is now considered an agricultural commodity in the US, there is a lot of resistance toward hemp cultivation in many parts of the country. In particular, some residents in neighbourhoods near hemp fields have complained about the pungent smell of terpenes emitted by hemp plants. Additionally, in some regions of the US, some vineyard owners have reported fears regarding the impact that hemp terpenes may have on their wine grapes. These concerns have been raised by local lawmakers in different jurisdictions[15]. On the other hand, traditional farmers have been exploring hemp as a means to augment their overall farm revenue. While both pro- and anti-hemp arguments are legitimate, there is no empirical research to support the position of some vineyard owners. Specifically, there has been little discussion about the properties of terpenes and their interactions with wine grapes or the possible methods of terpene transfer from one crop to another. In the next section, we discuss the types of terpenes in hemp and wine grapes and the methods of terpene transfer between plants.

Terpenes in hemp

Terpenes are the compounds responsible for hemp's aroma, and they are primarily found in the tips of the plant's shoot system. The main volatiles are monoterpenes and sesquiterpenes, with β-myrcene and β-caryophyllene as the most representative monoterpene and sesquiterpene, respectively[2]. CBD hemp varieties have more complex volatiles than fibre hemp varieties. The phenolic compounds in CBD hemp varieties are found in large amounts in the flowers. Hence, the terpene production of CBD hemp varieties is amplified between flowering and maturity of the plants[1]

Terpenes in wine grapes

The aromas of wine grape varietals and wines have long been of interest to researchers due to the complex flavour profiles they present. Significant contributors to the flavour and aromatic characteristics of wine grape varietals are the numerous terpene compounds produced through viticultural management and oenology processes, which include vine and fruit management, plant nutrition, harvest protocols, biosynthesis in grapes, enzyme activation during grape crushing, grape fermentation, and wine maturation[25]. The most prominent terpene compounds found in Muscat and related aromatic grapes and wines are linalool, geraniol, nerol, terpineol, and hotrienol. Several researchers[6] have found that longer maceration periods were related to greater terpene content in wines. Furthermore, certain yeast species (e.g., *Saccharomyces cerevisiae*) were shown to be capable of enzymatically producing citronellol from geraniol and nerol, thereby transforming the aromatic profile of wine[26].The characteristic flavours and aromas of grapes and wines are dynamic due to the plethora of transformations inherent to the complex biochemical mechanisms involved in grape cultivation and wine production.

Wine grapes develop complex aromas from both natural processes and transformations during the winemaking process, and it is important to determine how these processes and transformations affect the flavour of wines. Most vineyards are planted close to other crops that may produce high levels of aromatic compounds. Hence, it is not prudent to assume that hemp is the only crop whose volatile terpenes could affect the quality of agricultural commodities. Several researchers[12,24,42] have explored the potential transfer of volatile terpenes among plants. A handful of plants (Eucalyptus, Lavandula, and *Arabidopsis*) have been documented to emit volatile terpenes[40].Volatile terpenes in *Arabidopsis* are biosynthesized to monoterpenes and sesquiterpenes, which are among the major volatile terpenes in hemp. The three major terpenes found in *Arabidopsis* are limonene, β-myrcene, and β-ocimene[12]. β-myrcene and β-ocimene are among the most abundant terpenes in hemp varieties. Hence, *Arabidopsis* and hemp varieties may emit similar terpenes. The impact of eucalyptus terpenes on wine grapes in Australia is often cited by vineyard owners in Sonoma County in the US as a reason to worry about the potential impact of hemp terpenes on wine grapes. However, few details are known about the process by which eucalyptus trees taint wine. In the next section, we review studies that have examined eucalyptol and its potential for tainting wine grapes.

Terpenes in eucalyptus

The compound 1,8-cineole (eucalyptol), which is a monoterpenoid, is the most abundant terpene in eucalyptus. It is also found in hemp and a large number of wine grape varieties. Some winemakers have surmised that eucalyptol contributes minty, herbal, and camphorous aromas that could lead to consumer rejection of wines.

There are several theories regarding the process by which eucalyptol ends up in finished wine. One theory posits that eucalyptol is introduced into wine grapes in vineyards within close proximity eucalyptus trees via mechanical means of transport. Several researchers[9,10,26] have studied finished wines made with grapes from a single vineyard and found that the eucalyptol concentration was 15.5 ppb in grapes grown within 50 meters of eucalyptus trees, whereas grapes grown outside of this range showed negligible levels of eucalyptol. In a similar study that focused on aromatic compounds in French red wines, several researchers[36] found that eucalyptol concentrations decreased significantly as the wine grape berries ripened, even though the eucalyptol concentrations in wine grape samples were as high as 18 μg/kg at their peak. This suggests that these compounds are endogenous and indicative of maturity rather than the result of exposure to exogenous terpene sources. In another study, several researchers[21,38] examined the potential of eucalyptus plants to taint wine grapes planted in close proximity; the results of this study were inconclusive, as eucalyptol was not found in wine grapes planted in close proximity to eucalyptus plants. This suggests that the presence of eucalyptol in wines cannot be definitively explained by terpene drift from exogenous sources.

Terpene transport mechanisms

Several researchers[21,32,41,42] have suggested a few physical mechanisms by which terpenes could be transferred from one crop to another. Air and soil have been identified as the two primary media for volatile terpene transfer.

Transport through air

It has been suggested that terpenes could be volatilized into the air and then deposited on and absorbed through the epidermis of leaves or grape skins. Plants emit volatile terpenes from their shoot systems into the atmosphere, and once these terpenes are emitted, they travel through the air until they encounter a target surface. If the target surface is a plant's foliage, the terpenes may be absorbed by the plant. Terpene transport through the air is facilitated by wind speed, wind direction, and temperature[5,43].

The rate of terpene absorption on the surface of foliage depends on the foliage's structure, the foliage's lipid content, and the plant species. Thinner leaves have been shown to have higher absorption rates for volatile terpenes in the air[30]. A study of the terpene content in the air at various distances from a hemp field would help shed light on this phenomenon, and a separate study of the absorption rates of leaves at a range of terpene concentrations in the air would allow for the modelling of maximum absorption rates. A better understanding of potential terpene transport from the leaves of the vine into the grapes is also needed.

Transport through soil

Terpenes emitted from one plant could accumulate in the topsoil and potentially be absorbed by a target plant's roots[4,31,32]. Volatile organic compounds (VOCs) such as terpenes are found both above and below ground. Microbial decomposition of plant material in the soil is a major source of terpene emissions. VOCs can also be emitted through plant roots. However, VOC emissions from plant roots could be mitigated by microbial activities in the soil. Some microbes in the soil break down plant litter and increase VOCs, while others consume VOCs that are produced via decomposition. Hence, net VOC emissions from the soil could be diminished by the aforementioned microbial processes.

VOC emissions in the soil could also be affected by the type of soil particles and the depth of each soil horizon. VOC deposition in the rhizosphere is affected by the distance from the VOC source.

Furthermore, the volume of VOCs deposited in the rhizosphere could be influenced by the length of time that the plants emitting the VOCs are in the field. For example, pine trees planted close to an open field are more likely to deposit high levels of VOCs in the rhizosphere as a result of long-term emission accumulation[24,32]. The rate of terpene emission from the soil into the atmosphere is far lower than the rate of terpene absorption from the atmosphere into the soil. Soil acts as a sink for VOCs that are deposited and absorbed in the rhizosphere[3,20].

It is unclear whether soil is a viable source of terpene emissions from hemp plants that are in a field for only 90 to 120 days. Further, the two plants that have been studied extensively as potential sources of terpene drift for wine grapes (eucalyptus and pine trees) are both perennials.

Objectives
A variety of plants (including wine grapes and hemp) produce copious amounts of volatile terpenes. However, it is unclear whether terpene transfer through the soil could be a viable source of terpene drift in wine grapes planted in close proximity to hemp plants. A detailed review of the literature has revealed no documented peer-reviewed research related to cannabis terpene drift in the US. Despite the lack of evidence to support the claim that hemp terpenes can taint wine grapes, several jurisdictions across the US are considering banning hemp cultivation because of this concern.

Therefore, the purpose of this study was to determine whether volatile terpenes from a CBD hemp field planted in close proximity to a vineyard could taint the wine grapes and the wines made from those grapes.

Materials and Methods

The research plot (located in Sonoma County, CA, USA) was planted with two varieties of CBD hemp: Boax and Cherry Wine Boax. The field was planted with 360 clones of the Boax variety in six beds and 240 seedlings of the Cherry Wine Boax wine variety in one bed. The vineyard in this study was an established student vineyard comprising 13 blocks and 39 wine grape varieties. The hemp field was located 68.5 feet (20.9 metres) from the vineyard. Sonoma County ordinance currently stipulates that hemp cultivation must occur 200 feet from property lines or 600 feet from residences and businesses.

Field Site
The experiment was conducted in 2019 at Shone Farm in Forestville, CA, USA (38° 30’ 18” N, 122° 52’ 20” W). The soil characteristics of the experimental plot are shown in Table 1.

Table 1. Characteristics of the top 12 inches of soil in the experimental plot.

Parameter	North Field	South Field
Sand (%)	45	47
Silt (%)	28	30
Clay (%)	26	22
Overall soil type	Loam	Loam

Organic matter (%)	3.5	4.3
pH	6.5	6.4
Nitrogen (ppm)	37	38
Active phosphorus (ppm)	36	49
Exchangeable potassium (ppm)	364	374
Calcium	1,293	1,329
Cation exchange capacity	10.0	10.5

Cherry Wine Boax seeds were sown in 50 cell trays in Pindstrup medium on June 14, 2019. Boax clones were delivered from a certified nursery on June 18, 2019. The seedlings and clones were kept in a greenhouse on mist benches with timers. The clones were moved into four-inch pots with a custom peat moss mix two weeks later. The clones and seedlings received two foliar applications of nitrogen using BioLink®. The seedlings and clones also received one foliar application of calcium-magnesium during the first three weeks of growth. The clones and seedlings were transplanted into the field on July 12, 2019, and July 26, 2019, respectively.

The experimental field consisted of seven raised beds that were 300 meters long and four feet wide. The clones were planted on six beds with five feet between plants. The seedlings were planted on one bed with three feet between plants. For odour mitigation and physical barriers from the rest of the farm, two additional beds were planted on the north side of the hemp field (one bed of corn and one bed of sunflowers), and another two were planted on the south end of the field (Figure. 1).

Figure 1. Layout of the experimental field.

Looking into hemp plot from Eastern edge.


Sativa-dominant hemp plant in flower.


View of entire hemp plot from Eastern edge. Note buffer plantings on both sides


View of buffer planting of Corn and Sunflower. Approximately 8 ft wide.


Looking from vineyard block corner towards corner of hemp plot 68.5 ft away.


SW Corner of vineyard block, 68.5 ft from Hemp plot

Each bed in the hemp field was fitted with one line of drip tape for irrigation. Each drip tape line delivered 250 gallons of water daily during a three-hour irrigation period. At the onset of flowering, each bed was fitted with an additional line of drip tape (increasing the number of lines per bed to two). The beds were irrigated every other day until two weeks before harvest. Although the hemp field was not certified organic, the entire farm was farmed organically, as a large portion of the farm was, in fact, certified organic. Hence, only pesticide and herbicide certified for organic farming were used.

Data Collection

Plant Material Collection

Plant material was collected from both the hemp field and vineyard once a week for four weeks (between September 20, 2019, and October 18, 2019) between the hours of 08:00 and 09:00. Sample collection started five weeks before harvest and ended a week before harvest. The hemp and wine grapes were harvested during the same week.

Hemp plant tissue samples were randomly collected using the California state hemp sampling protocol (composite sampling). The samples were stored in breathable paper bags and transported to the lab within 30 minutes. Once at the laboratory, the samples were processed and analysed for cannabinoid content and terpene profile.

Grape cluster samples were collected from six specific blocks in the vineyard. Three samples of Zinfandel (red wine grapes) were collected from row 21: one from the area nearest to the hemp field (vines 43 to 48), another from the centre of the row (vines 21 to 26), and the last from the area farthest from the hemp field (vines 1 to 6). A similar sampling technique was used to collect samples of white wine grapes from row 10. Samples were collected from different varieties of white wine grapes: Gewürztraminer (vines 1 to 3), Verdelho (vines 4 to 6), Viognier (vines 22 to 24), Sémillon (vines 25 to 27), Verdelho (vines 43 to 45), and Marsanne (vines 46 to 48). Once the samples were collected, they were placed in one-quart Ziplock bags, stored in an ice chest, and transported to the laboratory within an hour for terpene analysis.

Wine Samples

Finished wine samples were analysed to study the impact of hemp grown in close proximity to the wine grapes. Two sample groups of wine were made based on the proximity of the wine grapes to the hemp field and the addition of material other than grapes (MOG) in the wine.

The first sample group was based on the proximity of the wine grapes to the hemp field. Two batches of wine were made from this sample group. The first batch was made with grapes from the north end of the vineyard (row 21, vines 1 to 6), which was farthest from the hemp field. The second batch was made with grapes from the south end of the vineyard (row 21, vines 43 to 48), which was closest to the hemp field.

The second sample group was created by adding MOG to three batches of wine from south end of the vineyard. The amount of MOG added was based on industry standards. This portion of the study was conducted to assess the potential transmission of terpenes via other plant matter.

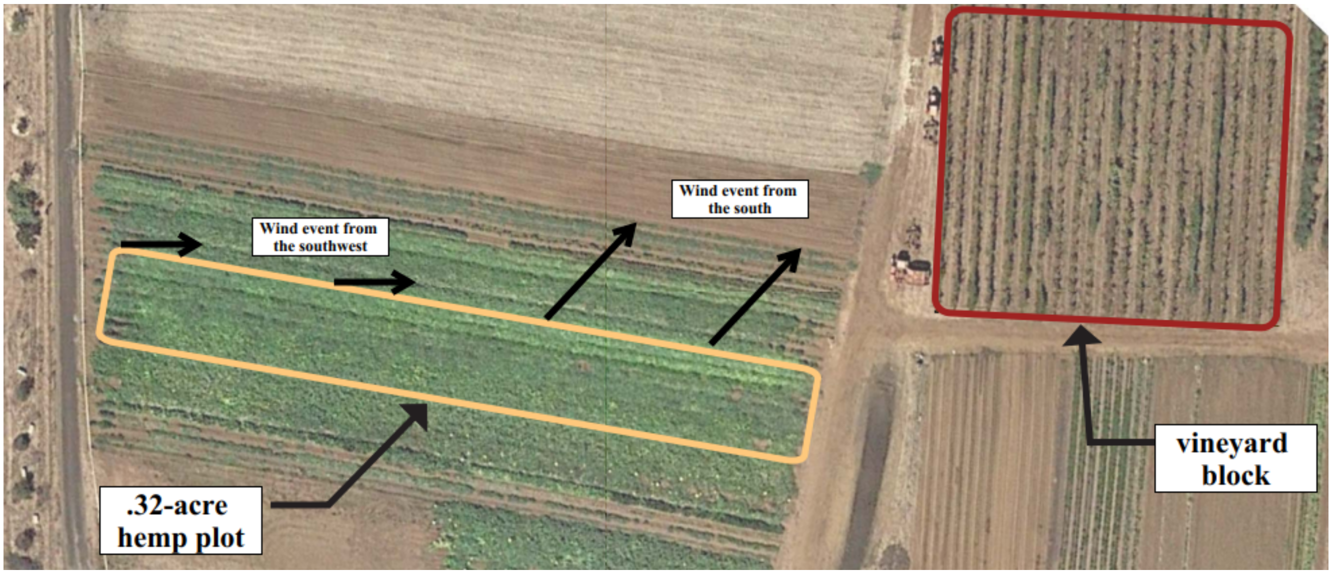
Approximately six kilograms of Zinfandel grapes were collected from row 21 (vines 43 to 48) on September 27, 2019. Leaves from the same vines were also collected and stored separately. These leaves were incorporated into the fermenters in different amounts to create three MOG samples (no leaves, 1% leaves by weight, and 3% leaves by weight). This was done to evaluate the effect of terpenes adsorbed into the leaves or absorbed onto the surface of leaves. The wines were produced at a commercial winery by an experienced winemaker using industry standards.

At the end of the winemaking process, one 750-mL glass bottle of wine was produced from each batch and sealed with a standard Diam wine cork.

Weather

Weather has a significant impact on plant growth, yield, physiologic expressions, and VOC emissions and drift[42,43]. The researchers collected several weather data points every 15 minutes during the study period using the weather station located at Shone Farm. Data points included evapotranspiration (ETo, in), relative humidity (RH, %), maximum and minimum RH (%), daily temperature (°F), daily maximum and minimum temperatures (°F), daily maximum wind speed (mph) and direction (°), and average wind speed (mph) and direction (°). Temperature, ETo, and RH data were presented as weekly averages using a wind rose plot that was created to capture average wind speed and direction.

Figure 2. Aerial view of the experimental plot showing the proximity of the vineyard to the hemp field and wind direction.



Analysis

For analysis, the researchers used a multistep process that included analytical and olfactory testing. Several researchers[18,37] have suggested that the best way to detect cannabis odours is through multidimensional gas chromatography (GC) in tandem with human olfaction. The terpene composition of the grape, hemp, and wine samples was determined using headspace gas chromatography-mass spectrometry (MS) (HS-20 GCMS-QP2010 SE; Shimadzu Corporation, Kyoto). The grape and hemp samples were analysed using headspace GC, and the wine samples were analysed using headspace GC and sensory analyses. Several researchers[33] have found that headspace GC provides a comprehensive method for analysing bioactive compounds in hemp.

Plant Materials

Plant material analysis showed the quantities of terpenes and cannabinoids as mass percentages. Approximately 100 mg of hemp inflorescence and 250 mg of grape mass were weighed into respective headspace vials. The gas chromatograph was fitted with a 30.0-m Rxi-624Sil MS column (Restek Corporation, Bellefonte, PA, USA). Helium was used as a carrier gas (1.64 mL/min 1 column flow). Oven settings were: 80 °C for 1 minute, steps of 12 °C/min up to 150 °C and then held at 150 °C for 1 min, and steps of 9 °C/min up to 250 °C and then held at 250 °C for 1 min with a run time of 20 min. The headspace was injected in split mode, and the split ratio was 1:50. Data acquisition was performed in selected-ion-monitoring mode using GC-MS real-time analysis software (Shimadzu Corporation, Kyoto, Japan). Terpene compounds were identified by comparing their mass spectra and retention times against reference standards.

Wine Samples

Six wine samples (one from each batch) were analysed using headspace GC-MS to quantitate terpene content. The purpose for this analysis was to determine whether terpenes from the hemp field diffused through the skin of the wine grapes during the growth period to the extent that they would be present in wine. The headspace GC-MS used for this study had a limit of quantification of 10 ppm and a limit of detection of 2 ppm.

In addition to analytical testing, a general chemistry panel was conducted on the wine samples by a commercial lab. This panel assessed the wine's percent of alcohol by volume, pH, titratable acid (TA), malic acid (ML), residual sugar (RS), and volatile acid (VA). The pH and TA were determined by titration performed using a Mettler-Toldeo T90 auto-titrator (Greifensee, Switzerland) with LabX software (Ontario, Canada). RS, VA, and ML were quantified via enzymatic analysis performed using a Siemens Advia 1200 Chemistry Analyzer. The alcohol content of the samples was quantified using the Anton-Paar Alcolyzer Wine Analysis System (Graz, Austria).

The aroma thresholds for terpene compounds in wines are generally around 100 ppb[25]. In a published study[21], the sensory detection threshold for eucalyptol, for example, was found to be as low as 3.2 ppb. This suggests that humans can sense much lower terpene levels than analytical instruments.
Due to the potential limited sensitivity of GC-MS to detect ultra-trace levels of terpenes in grapes in the parts-per-billion range, a sensory analysis was also conducted to expand the range of detection. The purpose of the sensory analysis was to determine whether low levels of hemp terpenes may have transferred to the grapes and impacted the taste and aroma of the resultant wines. Sensory studies [40,44] have been used to assess the impact of eucalyptol on the aroma of wine grapes planted in close proximity to eucalyptus plants but have shown a wide variance in the detection of aromas within and between sensory panels. However, sensory studies are still widely used to analyse wines.

Results and Discussion

Figures 3 and 4 show the quantified levels of the major terpenes in the plant material of the Boax and Cherry Wine Boax hemp varieties used in this study. The top three terpenes in the hemp varieties in this study were β-myrcene, α-ocimene, and β-caryophyllene. The production of these terpenes peaked in the hemp plants during the third week of data collection. If there is terpene drift, there should be a higher deposit of hemp terpenes in wine grapes during the same period.

Figure 3. Terpene profile evolution during the Cherry Wine Boax hemp growth cycle.

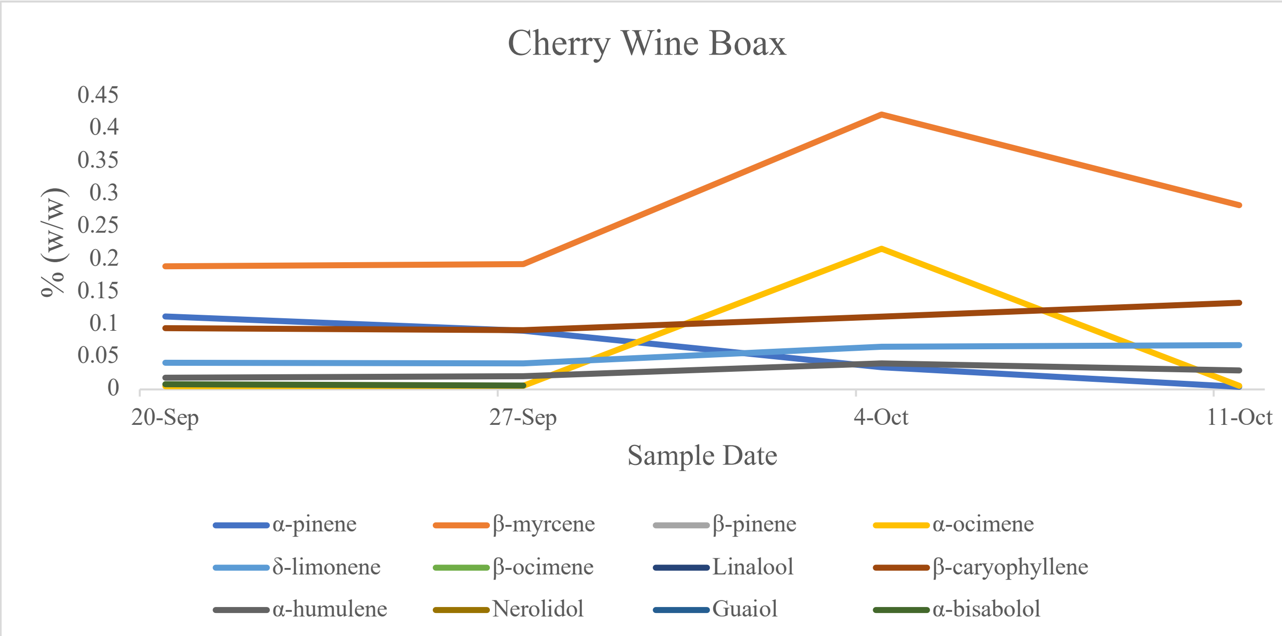
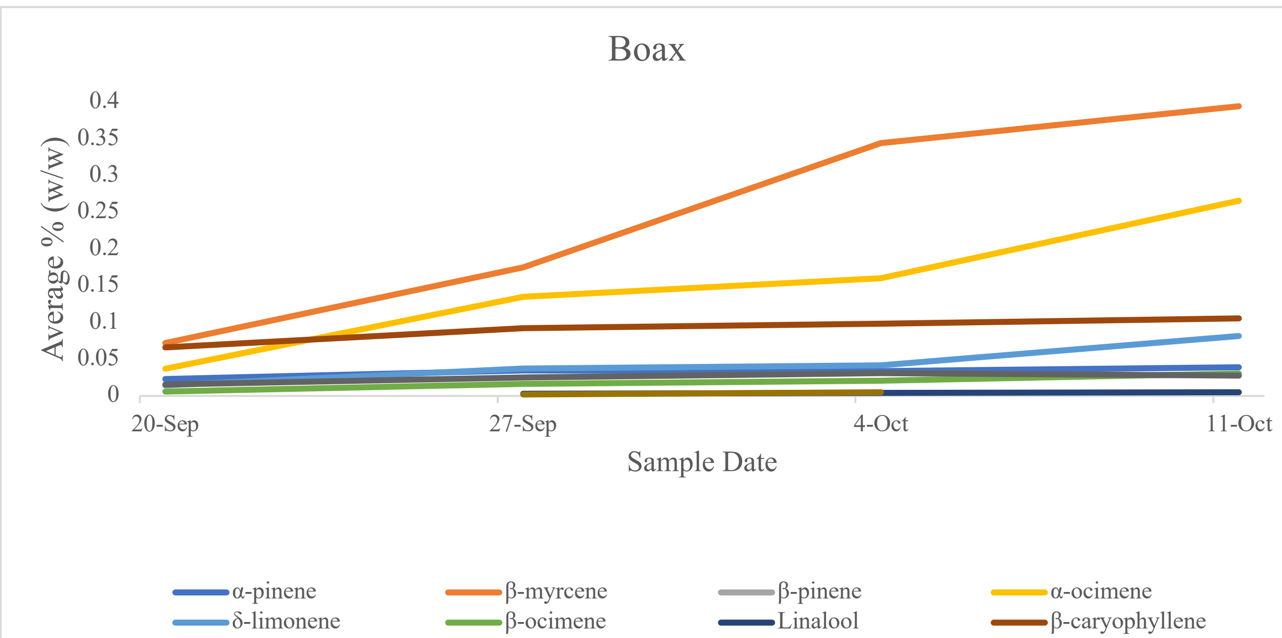


Figure 4. Terpene profile evolution during the Boax hemp growth cycle.



While the hemp plants' terpene levels peaked during the third week of data collection, no measurable level of hemp terpenes was found in the wine grapes during the same period. This is of particular significance because the hemp field was located 68.5 feet from the vineyard, while the local hemp ordinance requires a minimum of 200 feet easement from the property line. The distance required between these crops is nearly three times further than the conditions of this study. Figure 1 shows the corn and sunflower buffer plants on the north and south sides of the hemp field. The corn and the sunflower plants were taller than the hemp plants, and it is likely that volatile terpenes could have been trapped by these buffer plants.

The wine grape terpene analysis revealed non-detects for all of the terpenes included in the assay, and the results are therefore not depicted here (Tables A.I and A.II). The wine grape samples were analysed using the same headspace GC-MS technique as the hemp samples. The instrument was unable to detect any of the terpenes shown in Figures 3 and 4. Chromatograms for the wine grapes are shown in the supplementary information section (Figures A.I., A.II and A.III). The work of several researchers [9] supports this study's findings regarding the presence of hemp terpenes in wine grapes planted in close proximity to hemp plants.

Wine Analysis: Chemical
Samples of the wines made for this study were analysed at a commercial lab for the percent of alcohol by volume, pH, TA, RS, ML, and VA, which represents the combined concentration of acetic acid and ethyl acetate. The results are shown in Table 2.

Table 2. Chemical analysis of the wine samples.

Sample	Alcohol (% v/v)	pH	TA (g/100 mL)	RS (g/100 mL)	ML (mg/L)	VA (g/100 mL)
North	14.39	3.60	0.73	0.19	1692	0.071
South	11.79	3.33	0.71	0.02	372	0.023
3% MOG	14.81	3.44	0.75	0.01	1150	0.050
1% MOG	15.29	3.42	0.73	0.01	1125	0.048
No MOG	15.15	3.37	0.76	0.01	1028	0.061

The wines were all dry, although the north sample had slightly more RS. The wines were not inoculated with *Oenococcus oeni* after primary fermentation, as is customary in commercial production. Hence, ML concentrations were high. Furthermore, no sulphur dioxide or potassium metabisulfite were added to these wines during the winemaking process, so free and total sulphur dioxide concentrations were not analysed. These additions are often made during the commercial winemaking process to improve the palatability and stability of the wine.

The south sample's ML concentration suggests that this sample went through "wild" or "spontaneous" malolactic fermentation, in which native lactic acid bacteria (typically *Pediococcus, Lactobacillus, and Leuconostoc*) converted the ML to lactic acid and carbon dioxide. When each of the wine bottles was opened for sampling, it was apparent that a significant amount of carbon dioxide accumulated in the bottles, an indication that the wines went through at least a small amount of malolactic and/or primary fermentation in the bottle.

Wine Analysis: Sensory
The wines made for this study were analysed by experienced wine tasters (n = 10), who performed descriptive analyses of the various samples. The group consisted of four men and six women who were working, or who had worked, either as oenologists or winemakers. To prevent a biased response, the study objective (the potential of hemp terpenes to taint wine grapes) was not shared with the tasters. The wines were presented as two separate sample groups. The tasters were asked to compare the wine samples and characterize them, documenting any notable defects.

The sensory panel's comments regarding the wines made with grapes from the north and south ends of the vineyard are shown in Table 3. These comments were consistent with the chemical analysis of the wines, which showed that the north sample had the highest RS level. The north sample also had the highest VA, which may have contributed to the intensity of fruity aromas when present in moderate amounts.

Table 3. Sensory descriptive analysis of the wine samples.

Sample	Sample Set	Aroma	Taste and Mouthfeel
North	1	Ripe/candied fruit, sweaty socks	Blueberry jam, sour cherry, sweet, juicy, slight alcoholic burn, herbal notes, slight effervescence, bitter seed tannin
South	1	Red fruit, sweaty socks	Black cherry, muted, disjointed, acidic, less fruity aromas than the north sample, herbal notes/brambly, mousy, chalky/drying tannins

In comparison, wine made with grapes from the south side of the vineyard was markedly less fruity than wine made with grapes from the north side. The sensory panellists described the south sample as dry, and the chemical analysis showed that the south sample had less RS, which is usually associated with less sweetness.

Both samples were noted to have a subtle herbal note that was balanced with the overall flavour profile of each wine sample. The subtle herbal note was described as "brambly," a term that is commonly associated with the Zinfandel varietal[27] and less likely a result of that this character is the result of any extraneous conditions such as the hemp terpene.

The MOG wine samples had distinctly green (i.e., vegetal, herbal) flavours and aromas that rendered them non-useful for sensory analysis. These flavours and aromas are commonly associated with wines made with higher amounts of MOG and, therefore, they cannot be attributed to hemp [44]. Due to these confounding factors, no sensory data are reported for this second sample set.

Weather
Wind, temperature, and RH could affect the drift of VOCs. At higher temperatures during the summer, the most volatile monoterpenes such as α-pinene and β-myrcene are emitted at higher levels. When high wind activity is coupled with high VOC emissions, the potential of terpene drift is increased. For these reasons, this study collected data to better understand the relationship between weather factors and terpene drift.

The weekly average temperature and RH data are shown in Figure 5. Temperatures generally ranged between 4C to 32C, and RH stayed between 45 and 65%. These conditions should allow for varying amounts of terpene volatilization, with significant amounts of terpenes likely emitted during periods of maximum temperature[35]. Some of this temperature-dependent increase has been linked to elevated rates of terpene synthesis due to higher enzymatic activity in terpene-emitting plants[29]. Higher RH and temperature have been found to be correlated with increased terpene emissions[43]. Hence, in this study, data was collected for both factors to determine whether they were associated with terpene emissions from the hemp field.

Figure 5. Weekly relative humidity and temperature of the experimental field.

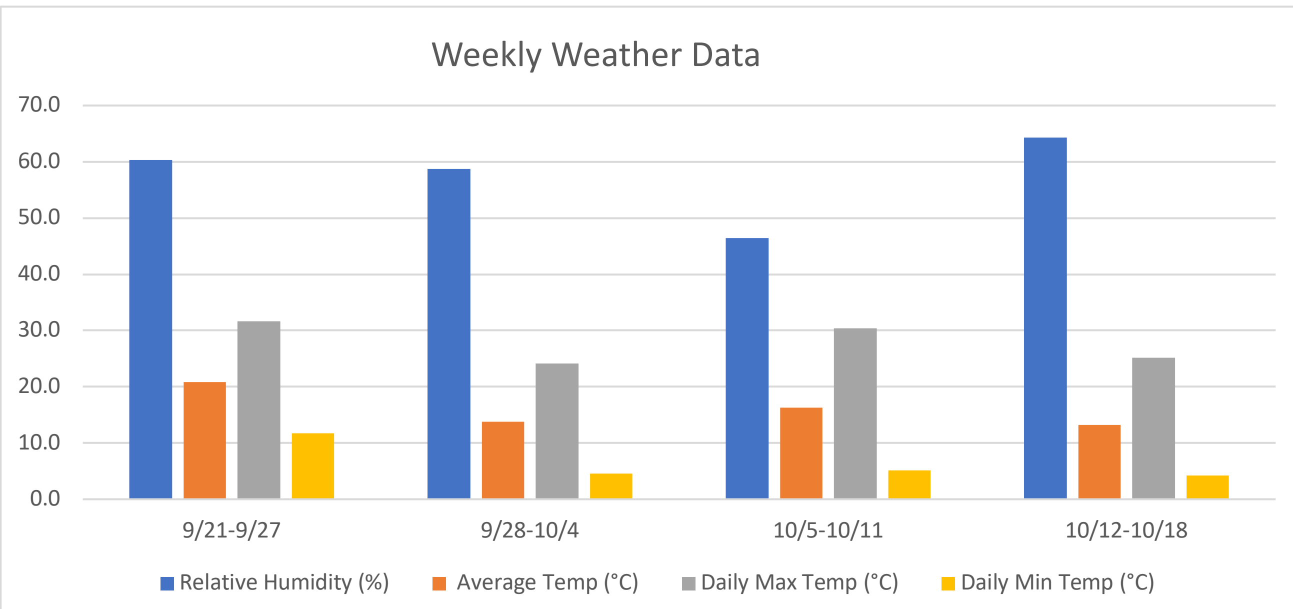


Table 4. Wind speed, wind direction, and evapotranspiration for the study period.

Week (2019)	Daily Max Wind Speed (mph)	Direction of Daily Max Wind Speed (°)	Average Wind Direction (°)	Daily Evapotranspiration (in)
9/21–9/27	14.0	341 NNW	209 SSW	0.15
9/28–10/4	17.1	95 E	246 WSW	0.14
10/5–10/11	11.0	134 SE	215 SSW	0.14
10/12–10/18	11.4	279 W	219 SW	0.12

The wind data in table 4 show that the wind was moving from the south and southwest directions most of the time, with many of the wind events blowing from the hemp field to the grapes. The wind speed and wind direction around the experimental field is also shown in a wind rose plot in the supplementary information section (Figure B). High temperatures are needed for increased terpene loss to the air. This suggests that there were weather conditions that were likely favourable for terpene emissions during a significant portion of the study period. Elevated temperature and RH coupled with higher-than-normal wind activity, with wind blowing directly over the vineyard, increased the likelihood of hemp terpenes tainting wine grapes. It is important to note that the physical odour barriers around the periphery of the hemp field (using beds of corn and sunflowers) could have mitigated potential terpene drift.

Conclusions

The experimental cultivation of hemp in close proximity to a vineyard was a unique opportunity that enabled the researchers to provide critical knowledge during the infancy of the hemp industry in the US. The future of hemp production in wine-growing regions of the US is dependent on a better understanding of the effects of hemp fields' proximity to established vineyards. We were able to record data on hemp's terpene profiles, the weather during the growing season of hemp and wine grapes, and a variety of sensory parameters pertaining to the finished wines in our study.

While this study cannot definitively determine the existence or absence of hemp terpenes in wine grapes planted in close proximity to hemp plants (bordered by plant barriers such as corn or sunflower), the researchers used current wine industry analytical instruments and wine sensory methods to show that hemp terpenes were not found in wine grapes or the resultant wines.

Limitations and Future Research

This study has several limitations. First, the experimental hemp field was not directly across from the vineyard, and it was not in the path of most of the wind activity. Second, the sensitivity of the analytical instruments used in the commercial wine labs did not have the capacity to quantitate the low terpene thresholds in the wine samples. Third, defects in the wines acted as confounding variables in the sensory analysis.

While this study has provided baseline data to inform farmers about the potential for hemp cultivation in wine regions, we believe that further research is warranted to move the hemp industry forward. We believe that if the aforementioned limitations are addressed, researchers will be able to more definitively determine hemp terpenes' potential to taint wine grapes.

Acknowledgements

The authors would like to thank the faculty and staff of the Agriculture and Natural Resources Department at Santa Rosa Junior College (Santa Rosa, CA, USA) for allowing them to use Shone Farm for this research. We are indebted to professor Joel Grogan for drawing the layout of the experimental field. We would also like to thank Sonoma Lab Works, an analytical lab in Santa Rosa, CA, USA for performing the lab tests for this study.

References:

1. Aizpurua-Olaizola, O., Soydaner, U., Öztürk, E., Schibano, D., Simsir, Y., Navarro, P., Etxebarria, N. & Usobiaga, A. Evolution of the Cannabinoid and Terpene Content during the Growth of Cannabis sativa Plants from Different Chemotypes. *Journal of Natural Products* **79**, 324-331(2016).
2. Andre, C.M., Hausman, J.F. & Guerriero, G. Cannabis sativa: The plant of the thousand and one molecule. *Frontier in Plant Science.* **7**, 1–1(2016).
3. Asensio, D., Penuelas, J., Llusia, J., Ogaya, R. & Filella, L. Interannual and interseasonal soil CO_2 efflux and VOC exchange rates in a Mediterranean holm oak forest in response to experimental drought, *Soil Biol. Biochem.* **39**, 2471-2484, doi:10.1016/j.soilbio.2007.04.019 (2007).
4. Asensio, D., Owen, S. M., Llusia, J. & Penuelas, J. The distribution of volatile isoprenoids in the soil horizons around Pinus halepensis trees. *Soil Biol. Biochem*. **40**, 2937-2947(2008).
5. Baldocchi, D.D., Fuentes, J.D., Bowling, D.R., Turnipseed, A.A. & Monson, R.K. Scaling Isoprene Fluxes from Leaves to Canopies: Test Cases over a Boreal Aspen and a Mixed Species Temperate Forest. *J. Appl. Meteor.* **38**, 885–898 (1999).
6. Baron, M., Prusova, B., Tomaskova, L., Kumsta, M. & Sochor, J. Terpene content of wine from the aromatic grape variety 'Israi Oliver' (*Vitis vinifera* L.) depends on maceration time. *Open Life Sci.* **12**, 42-50 (2017).
7. Belda, I., Ruiz, J., & Esteban-Fernández, A. et al. Microbial contribution to wine aroma and its intended use for wine quality improvement. *Molecules*. **22**,1–29 (2017).
8. Bertoli, A.,Tozzi, S., Pistelli, L. & Angelini, L.G. Fibre hemp inflorescences: From crop-residues to essential oil production. *Ind. Crops Prod*. **32**, 329–337 (2010).
9. Capone, D.L., Jeffery, D.W. & Sefton, M.A. Vineyard and fermentation studies to elucidate the origin of 1,8-cineole in Australian red wine. *J. Agric. Food Chem.* **60**, 2281-2287 (2012).
10. Capone, D.L., Van Leeuwen, K.D. & Taylor, K. et al. Evolution and occurrence of 1,8-cineole (Eucalyptol) in Australian wine," *Journal of Agricultural and Food Chemistry*. **59**,953–959 (2011).
11. Cascio, M.G., Pertwee, R.G. & Marini, P. The pharmacology and therapeutic potential of plant cannabinoids. In Cannabis sativa L.-Botany and Biotechnology (1st ed.). Chandra, S., Lata, H. & ElSohly, M.A. Springer International Publishing AG. Cham, Switzerland. ISBN 978-3-319-54563-9 (2017).
12. Chen, F., Tholl, D., D'Auria, J.C., Farooq, A., Pichersky, E. & Gershenzon, J. Biosynthesis and emission of terpenoid volatiles from Arabidopsis flower. *The Plant Cell.***15**,481-494; doi: https://doi.org/10.1105/tpc.007989 (2003).
13. Da Porto, C., Decorti, D. & Natolino, A. Separation of aroma compounds from industrial hemp inflorescences (Cannabis sativa L.) by supercritical CO_2 extraction and on-line fractionation. *Ind. Crops Prod.* **58,** 99–103 (2014)
14. ElSohly, M.A., & Slade, D. Chemical constituents of Cannabis: The complex mixture of natural cannabinoids. *Life Science*. **78**, 539-548 (2005).
15. Ezzone, Z. Cannabis Farm Applicant Presents Cannabis Terpenes Study, County Looks for Additional Information. Available: www.santamariasun.com/news/19255/cannabis-farm-applicant-presents-cannabis-terpenes-study-county-looks-for-additional-information/(2019).
16. Farina, L., Boido, E., Carrau, F., Versini, G., & Dellacassa, E. Terpene compounds as possible precursors of 1,8-cineole in red grapes and wines. *Journal of Agricultural Food Chemistry*. **53**, 1633-1636 (2005).

17. Flores-Sanchez, I. J. & Verpoorte, R. Secondary metabolism in Cannabis. *Phytochem*. Rev. **7**, 615–639 (2008).
18. Giese, M.W., Lewis, M.A. & Giese, L. et al. Development and validation of a reliable and robust method for the analysis of cannabinoids and terpenes in cannabis. *Journal of AOAC International.* **98**,1503-1522 (2015).
19. Girard, B., Fukumoto, I., Mazza, G., Delquis, P., & Ewert, B. Volatile terpene constituents in maturing Gewurztraminer grapes from British Columbia. *American Journal of Enology and Viticulture*. **53**, 99-109 (2002).
20. Hayward S., Muncey, R.J., James, A.E., Halsall, C.J. & Hewitt, C.N. Monoterpene emissions from soil in a Sitka spruce forest. *Atmospheric Environment.* **35**, 4081- 4087 (2001).
21. Herve, E., Price, S., & Burns, G. Eucalyptol in wines showing eucalyptus 388 aroma. In Proceedings of the VII'eme symposium international 389 d'Oenologie. Bordeaux, France. Actualites Oenologiques (Poster presentation) (2003).
22. Hodgson, M. Santa Barbara County Planning Commission Continues Appeal for Santa Ynez Cannabis Cultivation Permit. Available:santamariatimes.com/news/local/govt-and-politics/santa-barbara-county-planning-commission-continues-appeal-for-santa-ynez/article_469dfb56-d45e-531d-b4dd-e96fb3b1b257.html (2019).
23. Külheim, C., Padovan, A., Hefer, C., Krause, S.T., Köllner, T.G. & Myburg, A.A., et al. The Eucalyptus terpene synthase gene family. *BMC Genomics*. **16**, 450; doi: 10.1186/s12864-015-1598-x (2015).
24. Lin C., Owen S.M. & Peñuelas J. (2007) Volatile organic compounds in the roots and rhizosphere of *Pinus* spp. *Soil Biology & Biochemistry.* **39**, 951-960 (2007).
25. Marais, J. Terpenes in the aroma of grapes and wines: a review. *S. Afr. Journal of Enology and Viticulture.* **4***,* 49-58 (1983).
26. Mateo, J.J., Jiminez, M. Monoterpenes in grape juice and wines. *Journal of Chromatography A,* **881**, 557-567 (2000).
27. Mobley, E. Zinfandel: California's heritage grape. *San Francisco Chronicle*. Available: https://thepress.sfchronicle.com/article/wine-facts-zinfandel (2016).
28. Molina, A., Reigosa, M.J. & Carballeria, A. Release of allelochemic agents from litter, through fall and topsoil in plantations of Eucalyptus globulus Labill in Spain, *Journal of Chemical Ecology.* **17**, 147-160 (1991).
29. Niinemets, Ü., Loreto, F. & Reichstein, M. Physiological and physicochemical controls on foliar volatile organic compound emissions. *Trends Plant Science*. **9**,180-186 (2004).
30. Noe, S.M., Copolovici, L., Niinemets, Ü. & Vaino, E. Foliar limonene uptake scales positively with leaf lipid content: non-emitting species absorb and release monoterpenes. *Plant Biology*. **9**, e86 (2007).
31. Ormeño, E., Baldy, V. & Ballini, C. et al. Production and Diversity of Volatile Terpenes from Plants on Calcareous and Siliceous Soils: Effect of Soil Nutrients. *J Chem Ecol.* **34**, 1219 (2008).
32. Ormeno, E., Fernandez, C., Bousquet-M˜elou, A., Greff, S., Morin´, E., Robles, C., Vila, B. & Bonin, G. Monoterpene and sesquiterpene emissions of three Mediterranean species through calcareous and siliceous soils in natural conditions, *Atmos. Environ.* **41**, 629-639 (2007a).
33. Pellati, F., Brighenti, V., Sperlea, J., Marchetti, L., Bertelli, D. & Benvenuti, S. New Methods for the Comprehensive Analysis of Bioactive Compounds in Cannabis sativa L. (hemp). *Molecules*. **23**, 2639; doi.org/10.3390/molecules23102639 (2018).

34. Peñuelas J, Asensio D, Tholl D, Wenke K, Rosenkranz M, Piechulla B *et al*. Biogenic volatile emissions from the soil. *Plant Cell Environ*. **37**,1866-1891(2014).
35. Penuelas, J., Fillela, I., Seco, R. & Llusia, J. Increase in isoprene and monoterpene emissions after re-watering of droughted Quercus ilex seedlings. *Biologia Plantarum*. **53**, 351e354 (2009).
36. Poitou, X., Thibon, C. & Darriet, P. 1,8-Cineole in French Red Wines: Evidence for a Contribution Related to Its Various Origins. *Journal of Agricultural and Food Chemistry*. **65**, 383-393 (2017).
37. Rice, S. & Koziel, J.A. Characterizing the Smell of Marijuana by Odor Impact of Volatile Compounds: An Application of Simultaneous Chemical and Sensory Analysis. *PLoS ONE.* **10,**12; doi:10.1371/journal.pone.0144160 (2015).
38. Robertson, M.A., & Wilson, S. The eucalypt aroma of southern Australian 418 Pinot Noir wines. In Proceedings of the sixth international 419 symposium for cool climate viticulture and oenology. New Zealand, Christ church (Poster presentation) (2006).
39. Rothschild, M., Bergström, G. & Wängberg, S. Cannabis sativa: volatile compounds from pollen and entire male and female plants of two variants, Northern Lights and Hawaiian Indica. *Botanical Journal of the Linnean Society.* **147**, 387-397 (2005).
40. Saliba, A.J., Bullock, J. & Hardie, W.J. Consumer rejection threshold for 1,8-cineole (eucalyptol) in Australian red wine. *Food Quality Preference*. **20**, 500-504 (2009).
41. Sharkey, T. D., Singsaas, E. L., Lerdau, M. T. & Geron, C. Weather effects on isoprene emission capacity and applications in emissions algorithms. *Ecol. Appl.* **9**, 1132-1137(2000).
42. Sharkey, T.D. & Yeh, S.S. (2001b) Isoprene emission from plants. *Annu Rev Plant Physiol.* **52**, 407-436 (2001b).
43. Vallat, A., Gu, H. & Dorn, S. How rainfall, relative humidity and temperature influence volatile emissions from apple trees in situ. *Phytochemistry*. **66**,1540-1550 (2005).
44. Ward, S.C., Petrie, P.R., Johnson, T.E., Boss, P.K., & Bastian, S.E.P. Unripe Berries and Petioles in Vitis vinifera cv. Cabernet Sauvignon Fermentations Affect Sensory and Chemical Profiles. *American Journal of Enology and Viticulture*. **66**, 435-443. doi:10.5344/ajev.2015.15016 (2015).
45. Williams, P.J., Strauss, C.R., Wilson, B. & Massy-Westropp, R.A. Novel monoterpene disaccharide glycosides of *vitis vinifera* grapes and wines. *Phytochemistry.* **21***,* 2013-2020 (1982).
46. Yang, Y., Jin, G.J., Wang, X.J., Kong, C.L., Liu, J. & Tao, Y.S. Chemical profiles and aroma contribution of terpene compounds in meili (*vitis vinifera* L.) grape and wine. *Food Chemistry.* 284, 155-161(2019).

Figure Legends

Figure 1. Layout of the experimental field. Shows the experimental field with mature hemp plants and wine grapes. Photos were taken during the data collection for this study.

Figure 2. Aerial view of the experimental plot showing the proximity of the vineyard to the hemp field and wind direction. The aerial view is Google image of the field that shows the size of the hemp field and the distance from the vineyard. It also shows the coordinates of the field and

Figure 3. Terpene profile evolution during the Cherry Wine Boax hemp growth cycle. Chart shows the level of major hemp terpenes in the Cherry Wine X Boax hemp variety during the sample collection phase of the study. Each terpene is represented by a colour coded line.

Figure 4. Terpene profile evolution during the Boax hemp growth cycle. Chart shows the level of major hemp terpenes in the Boax hemp variety during the sample collection phase of the study. Each terpene is represented by a colour coded line.

Figure 5. Weekly relative humidity and temperature of the experimental field. Chart shows the relative humidity, average temperature, daily maximum and daily minimum temperature all represented by colour coded bars. These data points were collected concurrently with the plant material sample collection.

Supplementary Information

Table A.I. Terpene screen results for the wine and grape samples.

Table A.I) Results of Terpene Screen on Wine and Grape Samples

Sample Details						Terpene Screen																						
Sample Date	Sample type	sample#	color	block	vines	alpha -pinene	Camphene	Beta-myrcene	Beta-pinene	delta-3-Carene	alpha-terpinene	alpha-Ocimene	delta-limonene	p-Cymene	beta-Ocimene	Caryophyllene Oxide	gamma-Terpinene	Terpinolene	Linalool	Isopulegol	Geraniol	beta-caryophyllene	alpha-humulene	Nerolidol 1	Nerolidol 2	Guaiol	alpha-Bisabolol	Eucalyptol
9/20/2019	Grapes	H2559	w	10	(1-3)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2560	w	10	(22-24)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2561	w	10	(43-45)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2562	w	11	(1-3)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2563	r	21	(1-3)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2564	r	21	(22-24)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2565	r	21	(43-45)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
9/27/2019	Grapes	H2658	r	21	(1-2)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2659	r	21	(23-24)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2666	r	21	(43-45)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2661	w	10	(1-2)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2660	w	10	(23-24)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2662	w	10	(46-47)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
10/4/2019	Grapes	H2755	r	21	(1-3)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2756	r	21	(46-47)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2757	r	21	(23-24)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2758	w	10	(1-3)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2759	w	10	(23-24)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2760	w	10	(46-47)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
10/4/2019	Wine	H2761	r	21	(1-6)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2762	r	21	(43-48)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
10/11/2019	Grapes	H2846	r	21	(46-47)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2847	r	21	(23-24)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2848	r	21	(1-2)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2849	w	10	(46-47)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2850	w	10	(23-24)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2851	w	10	(1-2)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
10/11/2019	Grape vine Leaves	H2852	n/a	21	1-6	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
		H2853	n/a	21	43-46	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD

Table A.II. Terpene concentrations in the hemp samples collected throughout the study.

Table A.II) Terpene concentration of hemp samples collected throughout season

	Date of Sample Collection	9/20/2019			9/27/2019			10/4/2019			9/11/2019		
	Sample Name	HEMP A	HEMP B	HEMP C	HEMP A	HEMP B	HEMP C	HEMP A	HEMP B	HEMP C	HEMP A	HEMP B	HEMP C
	Sample I.D.	H2566	H2567	H2568	H2663	H2664	H2665	H2763	H2764	H2765	<LOD	<LOD	<LOD
Terpene concentration (ug/L)	alpha-pinene	0.027	0.019	0.112	0.038	0.031	0.09	0.051	0.017	0.034	0.031	0.047	0.004
	Camphene	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
	Beta-myrcene	0.075	0.069	0.189	0.191	0.159	0.192	0.322	0.366	0.422	0.45	0.338	0.283
	Beta-pinene	0.006	0.005	0.035	<LOD	<LOD	<LOD	0.014	<LOD	<LOD	<LOD	<LOD	<LOD
	delta-3-Carene	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
	alpha-terpinene	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
	alpha-Ocimene	0.04	0.034	0.005	0.138	0.131	0.006	0.145	0.175	0.216	0.282	0.249	0.006
	delta-limonene	0.015	0.014	0.041	0.038	0.036	0.04	0.038	0.046	0.066	0.094	0.069	0.068
	p-Cymene	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
	beta-Ocimene	0.007	0.005		0.017	0.016	<LOD	0.026	0.016	0.024	0.022	0.039	<LOD
	Caryophyllene Oxide	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
	gamma-Terpinene	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
	Terpinolene	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
	Linalool	<LOD	<LOD	<LOD	0.003	0.003	<LOD	0.004	0.005	0.005	0.005	0.005	<LOD
	Isopulegol	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
	Geraniol	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
	beta-caryophyllene	0.056	0.076	0.094	0.092	0.093	0.091	0.102	0.095	0.112	0.095	0.116	0.133
	alpha-humulene	0.013	0.018	0.018	0.024	0.026	0.02	0.028	0.034	0.04	0.025	0.031	0.029
	Nerolidol 1	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
	Nerolidol 2	<LOD	<LOD	<LOD	<LOD	<LOD	0.002	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
	Guaiol	<LOD	<LOD	<LOD	0.002	0.002	<LOD	<LOD	0.005	0.005	<LOD	<LOD	<LOD
	alpha-Bisabolol	<LOD	<LOD	0.008	<LOD	<LOD	0.006	0.004	<LOD	<LOD	<LOD	<LOD	0.008
	Eucalyptol	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD

Figure A.I. Total ion chromatogram for sample H2756.

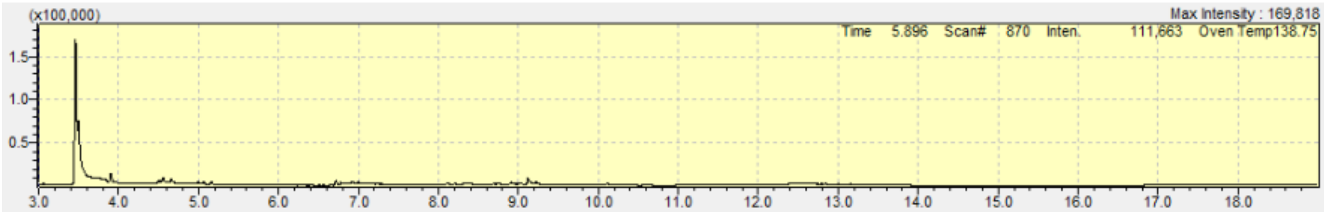


Figure A.II. Total ion chromatogram for sample H2762.

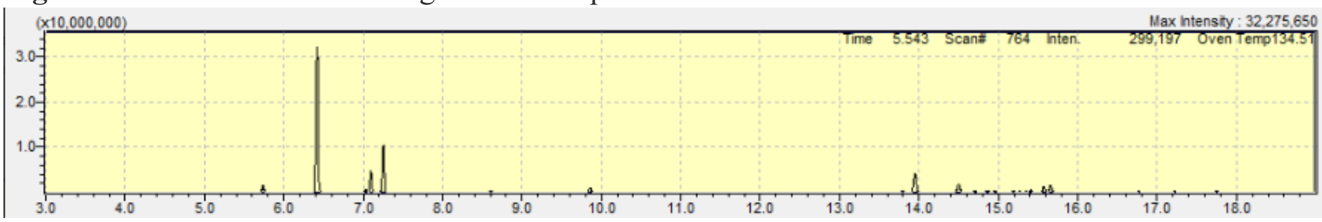
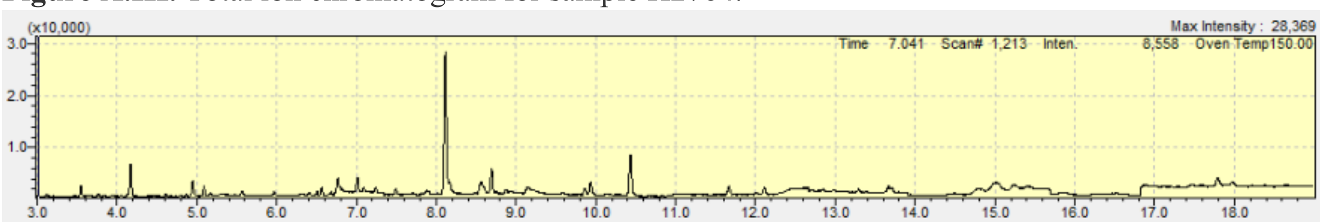
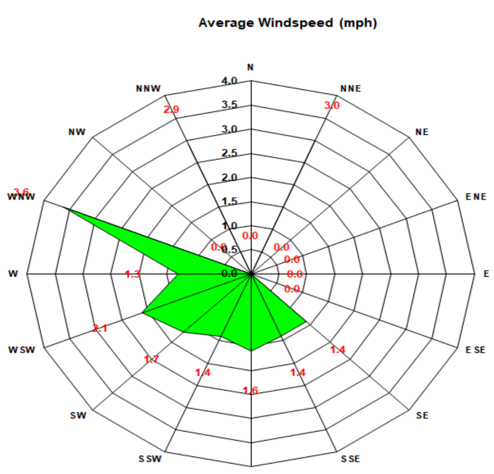


Figure A.III. Total ion chromatogram for sample H2764.



A wind rose plot was created to show the average wind speed from each direction (Figure B). The highest average speed was from the west-northwest direction, but most wind events were from between the west-southwest and southeast directions. The vineyard is nearly due north from the hemp field. Figure 2 shows examples of wind events from the southwest and south directions in relation to the two fields.

Figure B. Graphical representation of wind speed and wind direction.



Certificate of Analysis

QA SAMPLE - INFORMATIONAL ONLY

ICAL ID: 20190731-057
Sample: 1907ICA3745.11012
PENCE ROSA CHARDONNAY
Strain: PENCE ROSA CHARDONNAY
Category: Ingestible

Responsible AG Testing
Lic. #
None
San Diego, CA 92121

Lic. #

Batch#:
Primary Size:
Total/Batch Size:
Collected: 08/01/2019; Received: 08/01/2019
Completed: 08/01/2019

Moisture	Δ9-THC	CBD	Total Cannabinoids	Total Terpenes
NT	**NT**	**NT**	**NT**	**0.00 mg/g**
Water Activity				
NT				

Summary	SOP Used	Date Tested	
Batch			Pass
Terpenes	SOP:TERP.MS.Beverage1	08/01/2019	Complete
Pesticides	PEST.002 Edible	07/31/2019	Pass

Scan to see results

Cannabinoid Profile

Analyte	LOQ	LOD	%	mg/g	Analyte	LOQ	LOD	%	mg/g

Total THC=THCa * 0.877 + d9-THC;Total CBD = CBDa * 0.877 + CBD; NR= Not Reported, ND= Not Detected, *Reported by Dry Mass*; *analytical instrumentation used Cannabinoids:UHPLC-DAD, Moisture:Mass by Drying,Water Activity:Water Activity Meter, Foreign Material:Microscope*

Terpene Profile

Analyte	LOQ	LOD	%	mg/g	Analyte	LOQ	LOD	%	mg/g
α-Bisabolol	0.20	0.10	ND	ND	δ-Limonene	0.20	0.10	ND	ND
α-Humulene	0.20	0.10	ND	ND	Eucalyptol	0.20	0.10	ND	ND
α-Pinene	0.20	0.10	ND	ND	γ-Terpinene	0.20	0.10	ND	ND
α-Terpinene	0.20	0.10	ND	ND	Geraniol	0.20	0.10	ND	ND
β-Caryophyllene	0.20	0.10	ND	ND	Linalool	0.20	0.10	ND	ND
β-Myrcene	0.20	0.10	ND	ND	Ocimene	0.20	0.10	ND	ND
β-Ocimene	0.20	0.10	ND	ND	(-)-Guaiol	0.20	0.10	ND	ND
β-Pinene	0.20	0.10	ND	ND	(-)-Isopulegol	0.20	0.10	ND	ND
Camphene	0.20	0.10	ND	ND	p-Cymene	0.20	0.10	ND	ND
Caryophyllene Oxide	0.20	0.10	ND	ND	Terpinolene	0.20	0.10	ND	ND
cis-Nerolidol	0.20	0.10	ND	ND	trans-Nerolidol	0.20	0.10	ND	ND
δ-3-Carene	0.20	0.10	ND	ND	**Total**			**0**	**0**

NR= Not Reported thus no analysis was performed, ND= Not Detected thus the concentration is less then the Limit of Quantification (LOQ), *analytical instrumentation used:HS-GC-FID-FID*

Infinite Chemical Analysis Labs
8380 Miramar Mall #102
San Diego, CA
(858) 623-2740
www.infiniteCAL.com
Lic# C8-0000019-LIC

Josh M Swider
Josh Swider
Lab Director, Managing Partner
08/01/2019

Certificate of Analysis

ICAL ID: 20190731-057
Sample: 1907ICA3745.11012
PENCE ROSA CHARDONNAY
Strain: PENCE ROSA CHARDONNAY
Category: Ingestible

Responsible AG Testing
Lic. #
None
San Diego, CA 92121

Lic. #

Batch#:
Primary Size:
Total/Batch Size:
Collected: 08/01/2019; Received: 08/01/2019
Completed: 08/01/2019

Residual Solvent Analysis

Category 1	LOQ	LOD	Limit	Status	Category 2	LOQ	LOD	Limit	Status	Category 2	LOQ	LOD	Limit	Status

NR= Not Reported thus no analysis was performed, ND= Not Detected thus the concentration is less then the Limit of Quantification (LOQ) ,*analytical instrumentation used=HS-GC-FID-FID*

Heavy Metal Screening

	LOQ	LOD	Limit	Status

NR= Not Reported thus no analysis was performed, ND= Not Detected thus the concentration is less then the Limit of Quantification (LOQ) , *analytical instrumentation used:ICP-MS*

Microbiological Screening

	Result	Status

ND=Not Detected; *analytical instrumentation used:qPCR*

Infinite Chemical Analysis Labs
8380 Miramar Mall #102
San Diego, CA
(858) 623-2740
www.infiniteCAL.com
Lic# C8-0000019-LIC

Josh M Swider
Josh Swider
Lab Director, Managing Partner
08/01/2019

Certificate of Analysis

ICAL ID: 20190731-057
Sample: 1907ICA3745.11012
PENCE ROSA CHARDONNAY
Strain: PENCE ROSA CHARDONNAY
Category: Ingestible

Responsible AG Testing
Lic. #
None
San Diego, CA 92121

Lic. #

Batch#:
Primary Size:
Total/Batch Size:
Collected: 08/01/2019; Received: 08/01/2019
Completed: 08/01/2019

Chemical Residue Screening

Category 1		LOQ	LOD	Status
	µg/g	µg/g	µg/g	
Aldicarb	ND	0.05	0.03	Pass
Carbofuran	ND	0.05	0.03	Pass
Chlordane	ND	0.1	0.05	Pass
Chlorfenapyr	ND	0.1	0.05	Pass
Chlorpyrifos	ND	0.05	0.03	Pass
Coumaphos	ND	0.05	0.03	Pass
Daminozide	ND	0.05	0.03	Pass
DDVP	ND	0.05	0.03	Pass
Dimethoate	ND	0.05	0.03	Pass
Ethoprophos	ND	0.05	0.03	Pass
Etofenprox	ND	0.05	0.03	Pass
Fenoxycarb	ND	0.05	0.03	Pass
Fipronil	ND	0.05	0.03	Pass
Imazalil	ND	0.05	0.03	Pass
Methiocarb	ND	0.05	0.03	Pass
Methyl Parathion	ND	0.1	0.05	Pass
Mevinphos	ND	0.05	0.03	Pass
Paclobutrazol	ND	0.05	0.03	Pass
Propoxur	ND	0.05	0.03	Pass
Spiroxamine	ND	0.05	0.03	Pass
Thiacloprid	ND	0.05	0.03	Pass

Mycotoxins	LOQ	LOD	Limit	Status

Category 2		LOQ	LOD	Limit	Status
	µg/g	µg/g	µg/g	µg/g	
Abamectin	ND	0.05	0.03	0.3	Pass
Acephate	ND	0.05	0.03	5	Pass
Acequinocyl	ND	0.05	0.03	4	Pass
Acetamiprid	ND	0.05	0.03	5	Pass
Azoxystrobin	ND	0.05	0.03	40	Pass
Bifenazate	ND	0.05	0.03	5	Pass
Bifenthrin	ND	0.25	0.1	0.5	Pass
Boscalid	0.162	0.05	0.03	10	Pass
Captan	ND	0.35	0.2	5	Pass
Carbaryl	ND	0.05	0.03	0.5	Pass
Chlorantraniliprole	ND	0.05	0.03	40	Pass
Clofentezine	ND	0.05	0.03	0.5	Pass
Cyfluthrin	ND	0.35	0.25	1	Pass
Cypermethrin	ND	0.35	0.2	1	Pass
Diazinon	ND	0.05	0.03	0.2	Pass
Dimethomorph	ND	0.05	0.03	20	Pass
Etoxazole	ND	0.05	0.03	1.5	Pass
Fenhexamid	ND	0.05	0.03	10	Pass
Fenpyroximate	ND	0.05	0.03	2	Pass
Flonicamid	ND	0.05	0.03	2	Pass
Fludioxonil	ND	0.05	0.03	30	Pass
Hexythiazox	ND	0.05	0.03	2	Pass
Imidacloprid	ND	0.35	0.1	3	Pass

Category 2		LOQ	LOD	Limit	Status
	µg/g	µg/g	µg/g	µg/g	
Kresoxim Methyl	ND	0.05	0.03	1	Pass
Malathion	ND	0.05	0.03	5	Pass
Metalaxyl	ND	0.05	0.03	15	Pass
Methomyl	ND	0.05	0.03	0.1	Pass
Myclobutanil	ND	0.05	0.03	9	Pass
Naled	ND	0.1	0.05	0.5	Pass
Oxamyl	ND	0.2	0.1	0.3	Pass
Pentachloronitrobenzene	ND	0.1	0.05	0.2	Pass
Permethrin	ND	0.25	0.1	20	Pass
Phosmet	ND	0.05	0.03	0.2	Pass
Piperonyl Butoxide	ND	0.25	0.1	8	Pass
Prallethrin	ND	0.05	0.03	0.4	Pass
Propiconazole	ND	0.05	0.03	20	Pass
Pyrethrins	ND	0.25	0.1	1	Pass
Pyridaben	ND	0.05	0.03	3	Pass
Spinetoram	ND	0.05	0.03	3	Pass
Spinosad	ND	0.05	0.03	3	Pass
Spiromesifen	ND	0.05	0.03	12	Pass
Spirotetramat	ND	0.05	0.03	13	Pass
Tebuconazole	ND	0.05	0.03	2	Pass
Thiamethoxam	ND	0.25	0.1	4.5	Pass
Trifloxystrobin	ND	0.05	0.03	30	Pass

Unknown Analyte(s):

NR= Not Reported thus no analysis was performed, ND= Not Detected thus the concentration is less then the Limit of Quantification (LOQ) , *analytical instrumentation used:LC-MSMS & GC-MSMS*

Infinite Chemical Analysis Labs
8380 Miramar Mall #102
San Diego, CA
(858) 623-2740
www.infiniteCAL.com
Lic# C8-0000019-LIC

Josh M Swider
Josh Swider
Lab Director, Managing Partner
08/01/2019

Certificate of Analysis

QA SAMPLE - INFORMATIONAL ONLY

ICAL ID: 20190731-056
Sample: 1907ICA3745.11011
PENCE UNUM PINOT
Strain: PENCE UNUM PINOT
Category: Ingestible

Responsible AG Testing
Lic. #
None
San Diego, CA 92121

Lic. #

Batch#:
Primary Size:
Total/Batch Size:
Collected: 08/01/2019; Received: 08/01/2019
Completed: 08/01/2019

Moisture	Δ9-THC	CBD	Total Cannabinoids	Total Terpenes
NT	**NT**	**NT**	**NT**	**0.00 mg/g**
Water Activity				
NT				

Summary	SOP Used	Date Tested	
Batch			Pass
Terpenes	SOP:TERP.MS.Beverage1	08/01/2019	Complete
Pesticides	PEST.002 Edible	07/31/2019	Pass

Scan to see results

Cannabinoid Profile

Analyte	LOQ	LOD	%	mg/g	Analyte	LOQ	LOD	%	mg/g

Total THC=THCa * 0.877 + d9-THC;Total CBD = CBDa * 0.877 + CBD; NR= Not Reported, ND= Not Detected, *Reported by Dry Mass*; *analytical instrumentation used Cannabinoids:UHPLC-DAD, Moisture:Mass by Drying,Water Activity:Water Activity Meter, Foreign Material:Microscope*

Terpene Profile

Analyte	LOQ	LOD	%	mg/g	Analyte	LOQ	LOD	%	mg/g
α-Bisabolol	0.20	0.10	ND	ND	δ-Limonene	0.20	0.10	ND	ND
α-Humulene	0.20	0.10	ND	ND	Eucalyptol	0.20	0.10	ND	ND
α-Pinene	0.20	0.10	ND	ND	γ-Terpinene	0.20	0.10	ND	ND
α-Terpinene	0.20	0.10	ND	ND	Geraniol	0.20	0.10	ND	ND
β-Caryophyllene	0.20	0.10	ND	ND	Linalool	0.20	0.10	ND	ND
β-Myrcene	0.20	0.10	ND	ND	Ocimene	0.20	0.10	ND	ND
β-Ocimene	0.20	0.10	ND	ND	(-)-Guaiol	0.20	0.10	ND	ND
β-Pinene	0.20	0.10	ND	ND	(-)-Isopulegol	0.20	0.10	ND	ND
Camphene	0.20	0.10	ND	ND	p-Cymene	0.20	0.10	ND	ND
Caryophyllene Oxide	0.20	0.10	ND	ND	Terpinolene	0.20	0.10	ND	ND
cis-Nerolidol	0.20	0.10	ND	ND	trans-Nerolidol	0.20	0.10	ND	ND
δ-3-Carene	0.20	0.10	ND	ND	**Total**			**0**	**0**

NR= Not Reported thus no analysis was performed, ND= Not Detected thus the concentration is less then the Limit of Quantification (LOQ), *analytical instrumentation used:HS-GC-FID-FID*

Infinite Chemical Analysis Labs
8380 Miramar Mall #102
San Diego, CA
(858) 623-2740
www.infiniteCAL.com
Lic# C8-0000019-LIC

Josh M Swider

Josh Swider
Lab Director, Managing Partner
08/01/2019

Certificate of Analysis

ICAL ID: 20190731-056
Sample: 1907ICA3745.11011
PENCE UNUM PINOT
Strain: PENCE UNUM PINOT
Category: Ingestible

Responsible AG Testing
Lic. #
None
San Diego, CA 92121

Lic. #

Batch#:
Primary Size:
Total/Batch Size:
Collected: 08/01/2019; Received: 08/01/2019
Completed: 08/01/2019

Residual Solvent Analysis

Category 1	LOQ	LOD	Limit	Status	Category 2	LOQ	LOD	Limit	Status	Category 2	LOQ	LOD	Limit	Status

NR= Not Reported thus no analysis was performed, ND= Not Detected thus the concentration is less then the Limit of Quantification (LOQ) ,*analytical instrumentation used=HS-GC-FID-FID*

Heavy Metal Screening

	LOQ	LOD	Limit	Status

NR= Not Reported thus no analysis was performed, ND= Not Detected thus the concentration is less then the Limit of Quantification (LOQ) , *analytical instrumentation used:ICP-MS*

Microbiological Screening

	Result	Status

ND=Not Detected; *analytical instrumentation used:qPCR*

Infinite Chemical Analysis Labs
8380 Miramar Mall #102
San Diego, CA
(858) 623-2740
www.infiniteCAL.com
Lic# C8-0000019-LIC

Josh M Swider

Josh Swider
Lab Director, Managing Partner
08/01/2019

Certificate of Analysis

QA SAMPLE - INFORMATIONAL ONLY

ICAL ID: 20190731-056
Sample: 1907ICA3745.11011
PENCE UNUM PINOT
Strain: PENCE UNUM PINOT
Category: Ingestible

Responsible AG Testing
Lic. #
None
San Diego, CA 92121

Lic. #

Batch#:
Primary Size:
Total/Batch Size:
Collected: 08/01/2019; Received: 08/01/2019
Completed: 08/01/2019

Chemical Residue Screening

Category 1	μg/g	LOQ μg/g	LOD μg/g	Status
Aldicarb	ND	0.05	0.03	Pass
Carbofuran	ND	0.05	0.03	Pass
Chlordane	ND	0.1	0.05	Pass
Chlorfenapyr	ND	0.1	0.05	Pass
Chlorpyrifos	ND	0.05	0.03	Pass
Coumaphos	ND	0.05	0.03	Pass
Daminozide	ND	0.05	0.03	Pass
DDVP	ND	0.05	0.03	Pass
Dimethoate	ND	0.05	0.03	Pass
Ethoprophos	ND	0.05	0.03	Pass
Etofenprox	ND	0.05	0.03	Pass
Fenoxycarb	ND	0.05	0.03	Pass
Fipronil	ND	0.05	0.03	Pass
Imazalil	ND	0.05	0.03	Pass
Methiocarb	ND	0.05	0.03	Pass
Methyl Parathion	ND	0.1	0.05	Pass
Mevinphos	ND	0.05	0.03	Pass
Paclobutrazol	ND	0.05	0.03	Pass
Propoxur	ND	0.05	0.03	Pass
Spiroxamine	ND	0.05	0.03	Pass
Thiacloprid	ND	0.05	0.03	Pass

Mycotoxins	LOQ	LOD	Limit	Status

Category 2	μg/g	LOQ μg/g	LOD μg/g	Limit μg/g	Status
Abamectin	ND	0.05	0.03	0.3	Pass
Acephate	ND	0.05	0.03	5	Pass
Acequinocyl	ND	0.05	0.03	4	Pass
Acetamiprid	ND	0.05	0.03	5	Pass
Azoxystrobin	ND	0.05	0.03	40	Pass
Bifenazate	ND	0.05	0.03	5	Pass
Bifenthrin	ND	0.25	0.1	0.5	Pass
Boscalid	0.073	0.05	0.03	10	Pass
Captan	ND	0.35	0.2	5	Pass
Carbaryl	ND	0.05	0.03	0.5	Pass
Chlorantraniliprole	ND	0.05	0.03	40	Pass
Clofentezine	ND	0.05	0.03	0.5	Pass
Cyfluthrin	ND	0.35	0.25	1	Pass
Cypermethrin	ND	0.35	0.2	1	Pass
Diazinon	ND	0.05	0.03	0.2	Pass
Dimethomorph	ND	0.05	0.03	20	Pass
Etoxazole	ND	0.05	0.03	1.5	Pass
Fenhexamid	ND	0.05	0.03	10	Pass
Fenpyroximate	ND	0.05	0.03	2	Pass
Flonicamid	ND	0.05	0.03	2	Pass
Fludioxonil	ND	0.05	0.03	30	Pass
Hexythiazox	ND	0.05	0.03	2	Pass
Imidacloprid	ND	0.35	0.1	3	Pass

Category 2	μg/g	LOQ μg/g	LOD μg/g	Limit μg/g	Status
Kresoxim Methyl	ND	0.05	0.03	1	Pass
Malathion	ND	0.05	0.03	5	Pass
Metalaxyl	ND	0.05	0.03	15	Pass
Methomyl	ND	0.05	0.03	0.1	Pass
Myclobutanil	ND	0.05	0.03	9	Pass
Naled	ND	0.1	0.05	0.5	Pass
Oxamyl	ND	0.2	0.1	0.3	Pass
Pentachloronitrobenzene	ND	0.1	0.05	0.2	Pass
Permethrin	ND	0.25	0.1	20	Pass
Phosmet	ND	0.05	0.03	0.2	Pass
Piperonyl Butoxide	ND	0.25	0.1	8	Pass
Prallethrin	ND	0.05	0.03	0.4	Pass
Propiconazole	ND	0.05	0.03	20	Pass
Pyrethrins	ND	0.25	0.1	1	Pass
Pyridaben	ND	0.05	0.03	3	Pass
Spinetoram	ND	0.05	0.03	3	Pass
Spinosad	ND	0.05	0.03	3	Pass
Spiromesifen	ND	0.05	0.03	12	Pass
Spirotetramat	ND	0.05	0.03	13	Pass
Tebuconazole	ND	0.05	0.03	2	Pass
Thiamethoxam	ND	0.25	0.1	4.5	Pass
Trifloxystrobin	ND	0.05	0.03	30	Pass

Unknown Analyte(s):

NR= Not Reported thus no analysis was performed, ND= Not Detected thus the concentration is less then the Limit of Quantification (LOQ) , *analytical instrumentation used:LC-MSMS & GC-MSMS*

Infinite Chemical Analysis Labs
8380 Miramar Mall #102
San Diego, CA
(858) 623-2740
www.infiniteCAL.com
Lic# C8-0000019-LIC

Josh M Swider
Josh Swider
Lab Director, Managing Partner
08/01/2019

Certificate of Analysis

QA SAMPLE - INFORMATIONAL ONLY

ICAL ID: 20190731-055
Sample: 1907ICA3745.11010
PENCE ESTATE CHARDONNAY
Strain: PENCE ESTATE CHARDONNAY
Category: Ingestible

Responsible AG Testing
Lic. #
None
San Diego, CA 92121

Lic. #

Batch#:
Primary Size:
Total/Batch Size:
Collected: 08/01/2019; Received: 08/01/2019
Completed: 08/01/2019

Moisture	Δ9-THC	CBD	Total Cannabinoids	Total Terpenes
NT	**NT**	**NT**	**NT**	**0.00 mg/g**
Water Activity **NT**				

Summary	SOP Used	Date Tested	
Batch			Pass
Terpenes	SOP:TERP.MS.Beverage1	08/01/2019	Complete
Pesticides	PEST.002 Edible	07/31/2019	Pass

Scan to see results

Cannabinoid Profile

Analyte	LOQ	LOD	%	mg/g	Analyte	LOQ	LOD	%	mg/g

Total THC=THCa * 0.877 + d9-THC;Total CBD = CBDa * 0.877 + CBD; NR= Not Reported, ND= Not Detected, *Reported by Dry Mass*; *analytical instrumentation used Cannabinoids:UHPLC-DAD, Moisture:Mass by Drying,Water Activity:Water Activity Meter, Foreign Material:Microscope*

Terpene Profile

Analyte	LOQ	LOD	%	mg/g	Analyte	LOQ	LOD	%	mg/g
α-Bisabolol	0.20	0.10	ND	ND	δ-Limonene	0.20	0.10	ND	ND
α-Humulene	0.20	0.10	ND	ND	Eucalyptol	0.20	0.10	ND	ND
α-Pinene	0.20	0.10	ND	ND	γ-Terpinene	0.20	0.10	ND	ND
α-Terpinene	0.20	0.10	ND	ND	Geraniol	0.20	0.10	ND	ND
β-Caryophyllene	0.20	0.10	ND	ND	Linalool	0.20	0.10	ND	ND
β-Myrcene	0.20	0.10	ND	ND	Ocimene	0.20	0.10	ND	ND
β-Ocimene	0.20	0.10	ND	ND	(-)-Guaiol	0.20	0.10	ND	ND
β-Pinene	0.20	0.10	ND	ND	(-)-Isopulegol	0.20	0.10	ND	ND
Camphene	0.20	0.10	ND	ND	p-Cymene	0.20	0.10	ND	ND
Caryophyllene Oxide	0.20	0.10	ND	ND	Terpinolene	0.20	0.10	ND	ND
cis-Nerolidol	0.20	0.10	ND	ND	trans-Nerolidol	0.20	0.10	ND	ND
δ-3-Carene	0.20	0.10	ND	ND	**Total**			**0**	**0**

NR= Not Reported thus no analysis was performed, ND= Not Detected thus the concentration is less then the Limit of Quantification (LOQ), *analytical instrumentation used:HS-GC-FID-FID*

Infinite Chemical Analysis Labs
8380 Miramar Mall #102
San Diego, CA
(858) 623-2740
www.infiniteCAL.com
Lic# C8-0000019-LIC

Josh M Swider
Josh Swider
Lab Director, Managing Partner
08/01/2019

Certificate of Analysis

ICAL ID: 20190731-055
Sample: 1907ICA3745.11010
PENCE ESTATE CHARDONNAY
Strain: PENCE ESTATE CHARDONNAY
Category: Ingestible

Responsible AG Testing
Lic. #
None
San Diego, CA 92121

Lic. #

Batch#:
Primary Size:
Total/Batch Size:
Collected: 08/01/2019; Received: 08/01/2019
Completed: 08/01/2019

Residual Solvent Analysis

Category 1	LOQ	LOD	Limit	Status	Category 2	LOQ	LOD	Limit	Status	Category 2	LOQ	LOD	Limit	Status

NR= Not Reported thus no analysis was performed, ND= Not Detected thus the concentration is less then the Limit of Quantification (LOQ) ,*analytical instrumentation used=HS-GC-FID-FID*

Heavy Metal Screening

	LOQ	LOD	Limit	Status

NR= Not Reported thus no analysis was performed, ND= Not Detected thus the concentration is less then the Limit of Quantification (LOQ) , *analytical instrumentation used:ICP-MS*

Microbiological Screening

	Result	Status

ND=Not Detected; *analytical instrumentation used:qPCR*

Infinite Chemical Analysis Labs
8380 Miramar Mall #102
San Diego, CA
(858) 623-2740
www.infiniteCAL.com
Lic# C8-0000019-LIC

Josh Swider
Lab Director, Managing Partner
08/01/2019

Certificate of Analysis

QA SAMPLE - INFORMATIONAL ONLY

ICAL ID: 20190731-055
Sample: 1907ICA3745.11010
PENCE ESTATE CHARDONNAY
Strain: PENCE ESTATE CHARDONNAY
Category: Ingestible

Responsible AG Testing
Lic. #
None
San Diego, CA 92121

Lic. #

Batch#:
Primary Size:
Total/Batch Size:
Collected: 08/01/2019; Received: 08/01/2019
Completed: 08/01/2019

Chemical Residue Screening

Category 1	µg/g	LOQ µg/g	LOD µg/g	Status
Aldicarb	ND	0.05	0.03	Pass
Carbofuran	ND	0.05	0.03	Pass
Chlordane	ND	0.1	0.05	Pass
Chlorfenapyr	ND	0.1	0.05	Pass
Chlorpyrifos	ND	0.05	0.03	Pass
Coumaphos	ND	0.05	0.03	Pass
Daminozide	ND	0.05	0.03	Pass
DDVP	ND	0.05	0.03	Pass
Dimethoate	ND	0.05	0.03	Pass
Ethoprophos	ND	0.05	0.03	Pass
Etofenprox	ND	0.05	0.03	Pass
Fenoxycarb	ND	0.05	0.03	Pass
Fipronil	ND	0.05	0.03	Pass
Imazalil	ND	0.05	0.03	Pass
Methiocarb	ND	0.05	0.03	Pass
Methyl Parathion	ND	0.1	0.05	Pass
Mevinphos	ND	0.05	0.03	Pass
Paclobutrazol	ND	0.05	0.03	Pass
Propoxur	ND	0.05	0.03	Pass
Spiroxamine	ND	0.05	0.03	Pass
Thiacloprid	ND	0.05	0.03	Pass

Mycotoxins	LOQ	LOD	Limit	Status

Category 2	µg/g	LOQ µg/g	LOD µg/g	Limit µg/g	Status
Abamectin	ND	0.05	0.03	0.3	Pass
Acephate	ND	0.05	0.03	5	Pass
Acequinocyl	ND	0.05	0.03	4	Pass
Acetamiprid	ND	0.05	0.03	5	Pass
Azoxystrobin	ND	0.05	0.03	40	Pass
Bifenazate	ND	0.05	0.03	5	Pass
Bifenthrin	ND	0.25	0.1	0.5	Pass
Boscalid	0.167	0.05	0.03	10	Pass
Captan	ND	0.35	0.2	5	Pass
Carbaryl	ND	0.05	0.03	0.5	Pass
Chlorantraniliprole	ND	0.05	0.03	40	Pass
Clofentezine	ND	0.05	0.03	0.5	Pass
Cyfluthrin	ND	0.35	0.25	1	Pass
Cypermethrin	ND	0.35	0.2	1	Pass
Diazinon	ND	0.05	0.03	0.2	Pass
Dimethomorph	ND	0.05	0.03	20	Pass
Etoxazole	ND	0.05	0.03	1.5	Pass
Fenhexamid	ND	0.05	0.03	10	Pass
Fenpyroximate	ND	0.05	0.03	2	Pass
Flonicamid	ND	0.05	0.03	2	Pass
Fludioxonil	ND	0.05	0.03	30	Pass
Hexythiazox	ND	0.05	0.03	2	Pass
Imidacloprid	ND	0.35	0.1	3	Pass

Category 2	µg/g	LOQ µg/g	LOD µg/g	Limit µg/g	Status
Kresoxim Methyl	ND	0.05	0.03	1	Pass
Malathion	ND	0.05	0.03	5	Pass
Metalaxyl	ND	0.05	0.03	15	Pass
Methomyl	ND	0.05	0.03	0.1	Pass
Myclobutanil	ND	0.05	0.03	9	Pass
Naled	ND	0.1	0.05	0.5	Pass
Oxamyl	ND	0.2	0.1	0.3	Pass
Pentachloronitrobenzene	ND	0.1	0.05	0.2	Pass
Permethrin	ND	0.25	0.1	20	Pass
Phosmet	ND	0.05	0.03	0.2	Pass
Piperonyl Butoxide	ND	0.25	0.1	8	Pass
Prallethrin	ND	0.05	0.03	0.4	Pass
Propiconazole	ND	0.05	0.03	20	Pass
Pyrethrins	ND	0.25	0.1	1	Pass
Pyridaben	ND	0.05	0.03	3	Pass
Spinetoram	ND	0.05	0.03	3	Pass
Spinosad	ND	0.05	0.03	3	Pass
Spiromesifen	ND	0.05	0.03	12	Pass
Spirotetramat	ND	0.05	0.03	13	Pass
Tebuconazole	ND	0.05	0.03	2	Pass
Thiamethoxam	ND	0.25	0.1	4.5	Pass
Trifloxystrobin	ND	0.05	0.03	30	Pass

Unknown Analyte(s):

NR= Not Reported thus no analysis was performed, ND= Not Detected thus the concentration is less then the Limit of Quantification (LOQ) , *analytical instrumentation used:LC-MSMS & GC-MSMS*

Infinite Chemical Analysis Labs
8380 Miramar Mall #102
San Diego, CA
(858) 623-2740
www.infiniteCAL.com
Lic# C8-0000019-LIC

Josh M Swider

Josh Swider
Lab Director, Managing Partner
08/01/2019

Certificate of Analysis

QA SAMPLE - INFORMATIONAL ONLY

ICAL ID: 20190731-055
Sample: 1907ICA3745.11010
PENCE ESTATE CHARDONNAY
Strain: PENCE ESTATE CHARDONNAY
Category: Ingestible

Responsible AG Testing
Lic. #
None
San Diego, CA 92121

Lic. #

Batch#:
Primary Size:
Total/Batch Size:
Collected: 08/01/2019; Received: 08/01/2019
Completed: 08/01/2019

Moisture	Δ9-THC	CBD	Total Cannabinoids	Total Terpenes
NT	**NT**	**NT**	**NT**	**0.00 mg/g**
Water Activity **NT**				

Summary	SOP Used	Date Tested	
Batch			Pass
Terpenes	SOP:TERP.MS.Beverage1	08/01/2019	Complete
Pesticides	PEST.002 Edible	07/31/2019	Pass

Scan to see results

Cannabinoid Profile

Analyte	LOQ	LOD	%	mg/g	Analyte	LOQ	LOD	%	mg/g

Total THC=THCa * 0.877 + d9-THC;Total CBD = CBDa * 0.877 + CBD; NR= Not Reported, ND= Not Detected, *Reported by Dry Mass*; *analytical instrumentation used Cannabinoids:UHPLC-DAD, Moisture:Mass by Drying,Water Activity:Water Activity Meter, Foreign Material:Microscope*

Terpene Profile

Analyte	LOQ	LOD	%	mg/g	Analyte	LOQ	LOD	%	mg/g
α-Bisabolol	0.20	0.10	ND	ND	δ-Limonene	0.20	0.10	ND	ND
α-Humulene	0.20	0.10	ND	ND	Eucalyptol	0.20	0.10	ND	ND
α-Pinene	0.20	0.10	ND	ND	γ-Terpinene	0.20	0.10	ND	ND
α-Terpinene	0.20	0.10	ND	ND	Geraniol	0.20	0.10	ND	ND
β-Caryophyllene	0.20	0.10	ND	ND	Linalool	0.20	0.10	ND	ND
β-Myrcene	0.20	0.10	ND	ND	Ocimene	0.20	0.10	ND	ND
β-Ocimene	0.20	0.10	ND	ND	(-)-Guaiol	0.20	0.10	ND	ND
β-Pinene	0.20	0.10	ND	ND	(-)-Isopulegol	0.20	0.10	ND	ND
Camphene	0.20	0.10	ND	ND	p-Cymene	0.20	0.10	ND	ND
Caryophyllene Oxide	0.20	0.10	ND	ND	Terpinolene	0.20	0.10	ND	ND
cis-Nerolidol	0.20	0.10	ND	ND	trans-Nerolidol	0.20	0.10	ND	ND
δ-3-Carene	0.20	0.10	ND	ND	**Total**			**0**	**0**

NR= Not Reported thus no analysis was performed, ND= Not Detected thus the concentration is less then the Limit of Quantification (LOQ), *analytical instrumentation used:HS-GC-FID-FID*

Infinite Chemical Analysis Labs
8380 Miramar Mall #102
San Diego, CA
(858) 623-2740
www.infiniteCAL.com
Lic# C8-0000019-LIC

Josh M Swider
Josh Swider
Lab Director, Managing Partner
08/01/2019

Certificate of Analysis

QA SAMPLE - INFORMATIONAL ONLY

ICAL ID: 20190731-055
Sample: 1907ICA3745.11010
PENCE ESTATE CHARDONNAY
Strain: PENCE ESTATE CHARDONNAY
Category: Ingestible

Responsible AG Testing
Lic. #
None
San Diego, CA 92121

Lic. #

Batch#:
Primary Size:
Total/Batch Size:
Collected: 08/01/2019; Received: 08/01/2019
Completed: 08/01/2019

Residual Solvent Analysis

Category 1	LOQ	LOD	Limit	Status	Category 2	LOQ	LOD	Limit	Status	Category 2	LOQ	LOD	Limit	Status

NR= Not Reported thus no analysis was performed, ND= Not Detected thus the concentration is less then the Limit of Quantification (LOQ) ,*analytical instrumentation used=HS-GC-FID-FID*

Heavy Metal Screening

	LOQ	LOD	Limit	Status

NR= Not Reported thus no analysis was performed, ND= Not Detected thus the concentration is less then the Limit of Quantification (LOQ) , *analytical instrumentation used:ICP-MS*

Microbiological Screening

	Result	Status

ND=Not Detected; *analytical instrumentation used:qPCR*

Infinite Chemical Analysis Labs
8380 Miramar Mall #102
San Diego, CA
(858) 623-2740
www.infiniteCAL.com
Lic# C8-0000019-LIC

Josh M Swider
Josh Swider
Lab Director, Managing Partner
08/01/2019

Certificate of Analysis

QA SAMPLE - INFORMATIONAL ONLY

ICAL ID: 20190731-055
Sample: 1907ICA3745.11010
PENCE ESTATE CHARDONNAY
Strain: PENCE ESTATE CHARDONNAY
Category: Ingestible

Responsible AG Testing
Lic. #
None
San Diego, CA 92121

Lic. #

Batch#:
Primary Size:
Total/Batch Size:
Collected: 08/01/2019; Received: 08/01/2019
Completed: 08/01/2019

Chemical Residue Screening

Category 1	µg/g	LOQ µg/g	LOD µg/g	Status
Aldicarb	ND	0.05	0.03	Pass
Carbofuran	ND	0.05	0.03	Pass
Chlordane	ND	0.1	0.05	Pass
Chlorfenapyr	ND	0.1	0.05	Pass
Chlorpyrifos	ND	0.05	0.03	Pass
Coumaphos	ND	0.05	0.03	Pass
Daminozide	ND	0.05	0.03	Pass
DDVP	ND	0.05	0.03	Pass
Dimethoate	ND	0.05	0.03	Pass
Ethoprophos	ND	0.05	0.03	Pass
Etofenprox	ND	0.05	0.03	Pass
Fenoxycarb	ND	0.05	0.03	Pass
Fipronil	ND	0.05	0.03	Pass
Imazalil	ND	0.05	0.03	Pass
Methiocarb	ND	0.05	0.03	Pass
Methyl Parathion	ND	0.1	0.05	Pass
Mevinphos	ND	0.05	0.03	Pass
Paclobutrazol	ND	0.05	0.03	Pass
Propoxur	ND	0.05	0.03	Pass
Spiroxamine	ND	0.05	0.03	Pass
Thiacloprid	ND	0.05	0.03	Pass

Mycotoxins	LOQ	LOD	Limit	Status

Category 2	µg/g	LOQ µg/g	LOD µg/g	Limit µg/g	Status
Abamectin	ND	0.05	0.03	0.3	Pass
Acephate	ND	0.05	0.03	5	Pass
Acequinocyl	ND	0.05	0.03	4	Pass
Acetamiprid	ND	0.05	0.03	5	Pass
Azoxystrobin	ND	0.05	0.03	40	Pass
Bifenazate	ND	0.05	0.03	5	Pass
Bifenthrin	ND	0.25	0.1	0.5	Pass
Boscalid	0.167	0.05	0.03	10	Pass
Captan	ND	0.35	0.2	5	Pass
Carbaryl	ND	0.05	0.03	0.5	Pass
Chlorantraniliprole	ND	0.05	0.03	40	Pass
Clofentezine	ND	0.05	0.03	0.5	Pass
Cyfluthrin	ND	0.35	0.25	1	Pass
Cypermethrin	ND	0.35	0.2	1	Pass
Diazinon	ND	0.05	0.03	0.2	Pass
Dimethomorph	ND	0.05	0.03	20	Pass
Etoxazole	ND	0.05	0.03	1.5	Pass
Fenhexamid	ND	0.05	0.03	10	Pass
Fenpyroximate	ND	0.05	0.03	2	Pass
Flonicamid	ND	0.05	0.03	2	Pass
Fludioxonil	ND	0.05	0.03	30	Pass
Hexythiazox	ND	0.05	0.03	2	Pass
Imidacloprid	ND	0.35	0.1	3	Pass

Category 2	µg/g	LOQ µg/g	LOD µg/g	Limit µg/g	Status
Kresoxim Methyl	ND	0.05	0.03	1	Pass
Malathion	ND	0.05	0.03	5	Pass
Metalaxyl	ND	0.05	0.03	15	Pass
Methomyl	ND	0.05	0.03	0.1	Pass
Myclobutanil	ND	0.05	0.03	9	Pass
Naled	ND	0.1	0.05	0.5	Pass
Oxamyl	ND	0.2	0.1	0.3	Pass
Pentachloronitrobenzene	ND	0.1	0.05	0.2	Pass
Permethrin	ND	0.25	0.1	20	Pass
Phosmet	ND	0.05	0.03	0.2	Pass
Piperonyl Butoxide	ND	0.25	0.1	8	Pass
Prallethrin	ND	0.05	0.03	0.4	Pass
Propiconazole	ND	0.05	0.03	20	Pass
Pyrethrins	ND	0.25	0.1	1	Pass
Pyridaben	ND	0.05	0.03	3	Pass
Spinetoram	ND	0.05	0.03	3	Pass
Spinosad	ND	0.05	0.03	3	Pass
Spiromesifen	ND	0.05	0.03	12	Pass
Spirotetramat	ND	0.05	0.03	13	Pass
Tebuconazole	ND	0.05	0.03	2	Pass
Thiamethoxam	ND	0.25	0.1	4.5	Pass
Trifloxystrobin	ND	0.05	0.03	30	Pass

Unknown Analyte(s):

NR= Not Reported thus no analysis was performed, ND= Not Detected thus the concentration is less then the Limit of Quantification (LOQ) , *analytical instrumentation used:LC-MSMS & GC-MSMS*

Infinite Chemical Analysis Labs
8380 Miramar Mall #102
San Diego, CA
(858) 623-2740
www.infiniteCAL.com
Lic# C8-0000019-LIC

Josh M Swider

Josh Swider
Lab Director, Managing Partner
08/01/2019

Volatile Organic Carbon (VOC) Concentration Measurements at the Busy Bee Cannabis Farm
– Data Report –

To:

Ms. Amy M. Steinfeld
Brownstein Hyatt Fraber Schreck, LLP
1021 Anacapa Street, 2nd Floor
Santa Barbara, CA 93101
via e-mail at ASteinfeld@bhfs.com

SCS ENGINEERS

24219162.00| October 1, 2019

2370 Skyway Drive, Suite 101
Santa Maria, CA 93455
805-346-6591

Table of Contents

Figures

Tables

Appendices

1.0 INTRODUCTION

This report is a presentation of quality assured field measurement data relating to ambient and workspace concentrations of Volatile Organic Compounds (VOCs). All measurements have been conducted with regard to established EPA and ASTM standards and methods. All equipment utilized in this study had confirmed and updated calibration records to ensure accuracy in sampling. All sample analyses were performed by certified independent laboratories. The measurement study has been performed to provide real world measurements of ambient VOC concentrations in areas of cannabis cultivation at the facility as well as downwind of such operations. These measured concentrations have subsequently been compared to published health standards relative to the compounds detected by the program.

The sections to follow outline the field activities, the dates and times when sampling occurred, the exact location of each sample collected, and concentration values of the analytes measured. In addition, conclusions and data limitations are provided in the last section. Supporting backup information and raw data are provided in the appendices.

SPECIFIC GOALS AND OBJECTIVES

The following are the main goals and objectives of this air-monitoring project:

1. Measure the concentration of specific air pollutants relative to cannabis operations both at cultivation areas of flowering plants as well as downwind from these areas.

2. Compare the measured concentrations of these pollutants to published permissible exposure limits (PELs) and recommended exposure limits (RELs).

3. Determine if the measured concentrations indicate the presence of a possible health hazard to employees at the facility or downwind receptors.

2.0 OVERVIEW OF FIELD TESTING

SCS Engineers (SCS) conducted a limited field measurement program at the Busy Bee Facility ("Facility") to determine ambient concentrations of a specific list of gaseous compounds that are considered VOCs by the Environmental Protection agency (EPA) and the California Air Resources Board (CARB). This measurement program was conducted on September 18th, 2019. The purpose of the measurement program was to assess the relative health concerns related to potential VOC emissions from the Facility.

Sampling occurred in areas of, or downwind of, mature flowering plants. These flowering plants were in their final stage of maturing prior to harvest. The goal of the sampling was to capture worst-case emission results from cannabis operations at this facility as it is currently operating.

2.1 SAMPLING PERFORMED

The SCS team collected VOC samples at three locations within the cultivation area of the facility, two samples downwind of the facility, and one sample upwind of the facility for comparison purposes. Sampling exercises followed established EPA protocols and used recognized EPA and ASTM standards in determining concentration values in the samples collected. In summary, the primary methods employed in this field study are listed below:

- Speciated Volatile Organic Compounds (VOCs) via EPA TO-15

The actual sampling locations are shown in Figure 1 below. Table 1 provides the actual sampling details such as GPS location, time sampled, and relevant wind parameters.

Figure 1. Sampling Locations

Table 1: Actual Sample Details

Sample ID	General Sample Info			Location		Approx. Wind Data	
	Date Sampled	Approx. Time	Near	Latitude	Longitude	WS [m/s]	WD [from]
Upwind	18-Sep	13:58	Western Fence line	34◦37.231'	120◦13.672'	Lite	NW
GH-1	18-Sep	13:30	Inside GH	34◦37.179'	'120◦13.540'	Lite	W
GH-2	18-Sep	13:22	Inside GH	34◦37.177'	120◦13.550'	Lite	W
GH-3	18-Sep	13:49	Inside GH	34◦37.181'	120◦13.593'	Lite	WNW
Down-1	18-Sep	13:10	East of GH	34◦37.169'	120◦13.498'	Lite	W
Down-2	18-Sep	13:02	East of GH	34◦37.157'	120◦13.435'	Lite	WNW

3.0 FIELD AND ANALYTICAL METHODS USED

The following sections detail the methods utilized in the study.

3.1 FIELD SAMPLING VOC

VOC samples were collected directly from the ambient air at breathing level in evacuated 5-liter Summa canisters and allowed to come to just under ambient pressure. Each sample was collected in under 1-minute. Samples were shipped to Atmospheric Analysis and Consulting, Inc. (AAC) and were analyzed for VOCs according to EPA TO-15, as well as TICs listed in Table 2 below. Field logs are provided in Appendix C.

Atmospheric Analysis and Consulting, Inc. (AAC Lab) was founded as an air quality laboratory in June of 1993 by Dr. Sucha Parmar in Ventura, California.

AAC Lab is a privately-owned Small Minority Business certified through the Small Business Administration (SBA). AAC Lab holds NELAP and South Coast Air Quality Management District (SCAQMD) certifications.

3.2 ANALYTICAL METHODS EMPLOYED

TO-15 is one of EPA's Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. This method is designed for samples collected in Summa® canisters and analyzed by gas chromatography/mass spectrometry (GCMS). VOCs are defined by the method as organic compounds having a vapor pressure greater than 10^{-1} Torr at 25°C and 760 mmHG. The method compound list includes 59 VOC's which are also identified as hazardous air pollutants (HAP's) in Title III of the Clean Air Act amendments of 1990. In addition to the 59 VOCs listed by the method as The Target Compound List, Tentatively Identified Compounds (TICs) were also analyzed for that include a library of over 250,000 compounds. The identification of TICs in the sample is not considered "absolute" or "confirmed" but rather an estimate. However, it is still a useful tool for identifying the presence of possible compounds above detection limits. In this case, many terpenes that are known to be emitted by cannabis plants can be identified as TICs.

See Appendix A for further description of method.

Table 2: Complete List of Analyzed VOCs

TO-15 (VOC)					
CAS#	Compound	CAS#	Compound	CAS#	Compound
115-07-1	Propene	156-59-2	cis-1,2-Dichloroethene	111-65-9	n-Octane
75-71-8	Dichlorodifluoromethane (CFC 12)	141-78-6	Ethyl Acetate	127-18-4	Tetrachloroethene
74-87-3	Chloromethane	110-54-3	n-Hexane	108-90-7	Chlorobenzene
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	67-66-3	Chloroform	100-41-4	Ethylbenzene
75-01-4	Vinyl Chloride	109-99-9	Tetrahydrofuran (THF)	179601-23-1	m,p-Xylenes
106-99-0	1,3-Butadiene	107-06-2	1,2-Dichloroethane	75-25-2	Bromoform
74-83-9	Bromomethane	71-55-6	1,1,1-Trichloroethane	100-42-5	Styrene
75-00-3	Chloroethane	71-43-2	Benzene	95-47-6	o-Xylene
64-17-5	Ethanol	56-23-5	Carbon Tetrachloride	111-84-2	n-Nonane
75-05-8	Acetonitrile	110-82-7	Cyclohexane	79-34-5	1,1,2,2-Tetrachloroethane
107-02-8	Acrolein	78-87-5	1,2-Dichloropropane	98-82-8	Cumene
67-64-1	Acetone	75-27-4	Bromodichloromethane	80-56-8	alpha-Pinene
75-69-4	Trichlorofluoromethane (CFC 11)	79-01-6	Trichloroethene	103-65-1	n-Propylbenzene
67-63-0	2-Propanol (Isopropyl Alcohol)	123-91-1	1,4-Dioxane	622-96-8	4-Ethyltoluene
107-13-1	Acrylonitrile	80-62-6	Methyl Methacrylate	108-67-8	1,3,5-Trimethylbenzene
75-35-4	1,1-Dichloroethene	142-82-5	n-Heptane	95-63-6	1,2,4-Trimethylbenzene
75-09-2	Methylene Chloride	10061-01-5	cis-1,3-Dichloropropene	100-44-7	Benzyl Chloride
107-05-1	3-Chloro-1-propene (Allyl Chloride)	108-10-1	4-Methyl-2-pentanone	541-73-1	1,3-Dichlorobenzene
76-13-1	Trichlorotrifluoroethane (CFC 113)	10061-02-6	trans-1,3-Dichloropropene	106-46-7	1,4-Dichlorobenzene
75-15-0	Carbon Disulfide	79-00-5	1,1,2-Trichloroethane	95-50-1	1,2-Dichlorobenzene
156-60-5	trans-1,2-Dichloroethene	108-88-3	Toluene	5989-27-5	d-Limonene
75-34-3	1,1-Dichloroethane	591-78-6	2-Hexanone	96-12-8	1,2-Dibromo-3-chloropropane
1634-04-4	Methyl tert-Butyl Ether	124-48-1	Dibromochloromethane	120-82-1	1,2,4-Trichlorobenzene
108-05-4	Vinyl Acetate	106-93-4	1,2-Dibromoethane	91-20-3	Naphthalene
78-93-3	2-Butanone (MEK)	123-86-4	n-Butyl Acetate	87-68-3	Hexachlorobutadiene

4.0 QUALITY ASSURANCE MEASURES AND DOCUMENTATION

The following sections detail some of the quality assurance measures utilized by this sampling and measurement program to ensure the defensibility of the data collected. These measures include lab control samples, and chains of custody documentation. Flow calibrations are not required or necessary for collection of TO-15 samples.

4.1 CHAIN OF CUSTODY DOCUMENTATION

The integrity and traceability of samples from the time they are collected through the time data are reported is essential in any sampling and analysis program. The handling of the samples and transfer of custody must be well documented. A sample is considered to be in one's custody if it meets any of the following criteria:

1. In actual possession or in view of the person who collected the sample.
2. Locked in a secure area.
3. Placed in an area restricted to authorized personnel.

4.1.1 Field Sample Custody and Documentation

In order to maintain the integrity and traceability of samples, all information pertinent to field sampling was recorded in field logs. All samples were properly labeled prior to transport to respective laboratories, and were accompanied by completed chain-of-custody documentation. All documentation was recorded in indelible ink. See Appendix C.

4.1.2 Sample Labeling

Sample labels are necessary to prevent misidentification of samples. Labels were completed and affixed to sample containers at the time of sample collection.

4.1.3 Chain-of-Custody Records

To establish the documentation necessary to trace the sample possession from the time of collection, a chain-of-custody record was completely filled out and accompanied every sample. See Appendix C for these records.

5.0 SAMPLING RESULTS

There were many VOC's analyzed for, listed in Section 3.2, above; however, tables only show the compounds that were detected in samples above Sample Reporting Limits (SRLs). The following acronyms and abbreviations are used throughout the tables.

REL: Recommended Exposure Limit (NIOSH)

PEL: Permissible Exposure Limit (OSHA)

ND: Non-Detect

ppb: Parts Per Billion

ppm: Parts Per Million

INV: Invalid

µg: Microgram

m³: Cubic Meter

SRL: Sample Reporting Limit

In addition to concentration values, the Tables provide regulatory benchmarks for comparative purposes when available.

Table 3: VOCs Detected At Or Above Sample Reporting Limits

Sample ID	TO-15 Compounds (Detection compounds), PPB				TO-15 Compounds (Tentatively Identified Compounds), PPB		
	Chloromethane	Methanol	Ethanol	Acetone	alpha-Pinene	beta-Myrcene	D-Limonene
NIOSH REL	NA	200000	1000000	250000	100000	NA	NA
OSHA PEL	100000	200000	1000000	1000000	100000	NA	NA
Upwind	0.7	10.2	<SRL	8.64	ND	ND	ND
GH-1	<SRL	11.20	3.60	4.62	1.89	8.93	2.41
GH-2	<SRL	9.14	4.69	3.11	ND	ND	ND
GH-3	<SRL	13.30	3.76	5.12	ND	ND	ND
Down-1	<SRL	<SRL	<SRL	<SRL	ND	ND	ND
Down-2	<SRL	9.84	<SRL	<SRL	ND	ND	ND

6.0 CONCLUSIONS AND DATA LIMITATIONS

None of the samples collected during the course of this sampling project exceeded published NIOSH or OSHA exposure standards. The following sections provide discussions in regards to the sampling results.

CONCLUSIONS

All of the TO-15 area samples collected had measured concentrations of VOCs that were either below the limits of detection or significantly below the published NIOSH RELs and/or OSHA PELs. These samples were all representative of background concentrations in the area.

- The measured concentrations do not indicate the presence of a possible health concern in relation to employees or receptors downwind form the facility.

- Only one sample had detectable concentrations of terpenes as TIC's. However, the estimated concentrations are in the low PPB range. NIOSH and OSHA do not have health standards related to beta-myrcene or D-limonene. NIOSH and OSHA do have health standards for alpha-pinene, but the estimated concentration is at least three orders of magnitude below this standard. This sample was taken directly in the vicinity (within 1 foot) of flowering plants.

- Concentrations of downwind samples were all either less than the SRL for every compound or less than the measured background, indicating that the facility is not an appreciable source for the listed compounds.

EXPOSURE LIMITS

There is often confusion between exposure limits put out by different agencies even within the same administration. For example, the National Institute for Occupational Safety and Health (NIOSH) establishes Recommended Exposure Limits (RELs) whereas the Occupational Safety and Health Administration (OSHA) issues Permissible Exposure Limits (PELs).

NIOSH RELs are supposed to be based on the best available science (using human or animal health effects data). According to the CDC's website, "To the extent feasible, NIOSH will project not only a no-effect exposure, but also exposure levels at which there may be residual risks. This policy applies to all workplace hazards, including carcinogens, and is responsive to Section 20(a)(3) of the Occupational Safety and Health Act of 1970, which charges NIOSH to '… .describe exposure levels that are safe for various periods of employment, including but not limited to the exposure levels at which no employee will suffer impaired health or functional capacities or diminished life expectancy as a result of his work experience.'"

OSHA PELs, on the other hand, are subject to the rulemaking and political process, meaning that the interests of all parties involved are taken into consideration. Thus, OSHA does not have the luxury of relying strictly on science. Establishing PELs sometimes may come down to court rulings.

NIOSH Recommended Exposure Limits (RELs):

These values are TWA concentrations for up to a 10-hour workday during a 40-hour workweek.

OSHA Permissible Exposure Limits (PELs):

These values are TWA concentrations for up to an 8-hour workday during a 40-hour workweek.

DATA LIMITATIONS

There are several limitations associated with this sampling project. The major limitations are as follows:

- The results correspond to one particular period of time. These results may not necessarily be reproducible at another given period of time.

- Data obtained during this sampling project are averaged concentrations over short terms (Approximately 1 minute). Different averaging periods may lead to different results.

- Pollutant concentrations are highly dependent on dispersion parameters (i.e. winds, relative humidity, proximity to source).

Volatile Organic Carbon and Microbial Concentration Measurements For The CVW Organic Farm – Data Report –

To:

Ms. Amy M. Steinfeld
Brownstein Hyatt Fraber Schreck, LLP
1021 Anacapa Street, 2nd Floor
Santa Barbara, CA 93101
via e-mail at ASteinfeld@bhfs.com

SCS ENGINEERS

24220082.00 | May 18th, 2020

2370 Skyway Drive, Suite 101
Santa Maria, CA 93455
805-346-6591

Table of Contents

Section Page

Figures

Tables

Appendices

1.0 INTRODUCTION

SCS Engineers has been retained to assess the indoor and ambient air quality relative to volatile organic carbons (VOCs) (including terpenes) and microbial levels at CVW Organic Farm, located at 1440 Cravens Lane, Carpinteria, CA 93013. A general facility map is provided as Figure 1.

This report is a presentation of quality assured field measurement data relating to ambient and workspace concentrations of Volatile Organic Compounds (VOCs) and microbial spore levels. All measurements have been conducted with regard to established EPA, ASTM, and AIHA standards and methods. All equipment utilized in this study had confirmed and updated calibration records to ensure accuracy in sampling. All sample analyses were performed by certified independent laboratories. The measurement study has been performed to provide real world measurements of microbes as well as ambient VOC concentrations in areas of cannabis cultivation at the facility as well as downwind of such operations. These measured concentrations of VOCs have subsequently been compared to published health standards, when available, relative to the compounds detected by the program.

The sections to follow outline the field activities, the dates and times when sampling occurred, the exact location of each sample collected, and concentration values of the analytes measured. In addition, conclusions and data limitations are provided in the last section. Supporting backup information and raw data are provided in the appendices.

1.1 BACKGROUND

Cannabis, like many crops and flora, have the potential to emit various terpenes and terpenoids. Cannabis contains over 100 different terpenes and terpenoids. Different cannabis strains are comprised of various levels of specific terpenes leading to distinct aromas and flavors. For most cannabis strains, beta-myrcene, D-limonene, and alpha-pinene are the terpenes present in greatest concentration for non-dried flower. Terpene emissions from cannabis operations are highly dependent on several factors. First, cannabis plants have little to no terpene emissions until they are mature and begin to flower. While flowering, they have the potential to release terpenes, and the characteristic odor of the strain can be identified. The greatest potential for emissions occur when the mature flowering plant is harvested, processed, and dried. Limiting and controlling the locations for handling and drying of flowering cannabis plants at a cannabis cultivation facility can significantly reduce potential emissions. Terpene emissions from vegetation are also dependent on temperature and light intensity.

1.1.1 Sources of Terpenes

Terpenes are ubiquitous and naturally occurring compounds in the environment and have many biogenic sources. For example, alpha-pinene is emitted by coniferous trees such as pine trees as well as by rosemary, eucalyptus, and orange peel. Alpha-pinene is considered the most abundant terpene in nature. Beta-myrcene is emitted from bay leaves, lemon grass, mango, as well as hops and many other plants. Wild Thyme leaves can contain up to 40% by weight mycrene. Limonene is a central component of citrus fruit peels and is used as a flavoring agent in food manufacturing. Limonene is also emitted naturally by red and silver maple trees, cottonwoods, aspens, sumac, spruce, various pines, Douglas fir, hemlocks, cedars, larches, and true fir trees. Limonene is also used in many types of cosmetics, medicines, and food manufacturing and is approved by FDA in these applications.

1.1.2 Terpenes and Ozone

Ground level ozone, or photochemical smog, is created through a process of chemical reactions in the atmosphere. Through these reactions, primary pollutants such as Nitric Oxide (NO*) and VOCs react with sunlight to form secondary pollutants such as Nitric Acid and Ozone. In order for a location or region to be subjected to photochemical smog, several conditions must be fulfilled. First, there must be substantial vehicle traffic or other combustion sources in order to emit sufficient NO*. Second, there must be ample sunlight in order for the photochemical reactions to take place at a rapid rate. Finally, there must be limited dilution of the air mass such that the reactants are not diluted. In the case of the Central Coast of California and Santa Barbara County in particular, ozone formation is constrained by the atmospheric availability of NO*. In other words, nitrogen oxides, rather than hydrocarbons, are the rate limiting species for ground level ozone in the region.

1.1.3 Microbial Assessments

While microbial spores are ubiquitous, there are certain strains and spores that are hazardous to human health (whether as an allergen, or something more severe) and detrimental to indoor air quality (IAQ). The purpose of microbial sampling is to determine if there is microbial generation in a specified area, and if it has spread to adjacent areas. Generally, the right combination of elements, such as the availability of organic materials and water, must be present in order for spores to colonize and fungi to grow. Many mold spores are able to be directly identified by microscopic examination, but there are others that are harder to identify, and thus, counted in broader spore groups. It is possible that this method of grouping may mask an IAQ problem.

There are typical seasonal and yearly data patterns for each spore type identified for different climactic regions. It is important to note that the numbers that represent a typical California spring are averaged over different agricultural, rural, and suburban regions. The Central Coast of California and Santa Barbara County region, in particular, is full of biogenic sources due to the presence of farms and varying sources of agricultural production.

1.3 SPECIFIC GOALS AND OBJECTIVES

The following are the main goals and objectives of this air-monitoring project:

1.3.1 VOC Measurements:

1. Measure the concentration of specific air pollutants relative to cannabis operations at cultivation and processing areas of the facility as well as downwind from these areas.

2. Compare the measured concentrations of these pollutants to published permissible exposure limits (PELs) and recommended exposure limits (RELs).

3. Determine if the measured concentrations indicate the presence of a possible health hazard to employees at the facility or downwind receptors.

1.3.2 Cannabis Terpene Measurements:

1. Measure the concentration of cannabis specific terpenes within the processing areas of the facility.

2. Compare the measured concentrations of these compounds relative to processing area and activity. Assess if terpene-scrubbing activities are effective.

3. Determine if the measured concentrations indicate the presence of a possible health hazard to employees at the facility.

1.3.3 Microbial Measurements:

1. Measure the microbial concentration (spores/m^3) of ambient air in the local area, and at the CVW Organic Farms facility in the cultivation areas of flowering plants, as well as inside of the processing facility.

2. Compare the measured microbial concentrations from inside the CVW facility and the greenhouse to regional concentrations to assess the microbial generation of the facility at the time of sampling.

3. Determine if the measured concentrations indicate the presence of a possible health hazard to employees at the facility.

Figure 1. CVW Organic Farms Facility Map

2.0 OVERVIEW OF FIELD TESTING

SCS Engineers (SCS) conducted a limited field measurement program at CVW Organic Farms ("Facility") on 11-March and 15-April, 2020 to determine ambient concentrations of a specific list of gaseous compounds that are considered VOCs by the Environmental Protection agency (EPA) and the California Air Resources Board (CARB). Eight samples were collected for analysis over the two days. Additionally, Desert Research Institute (DRI) developed a method for assessing cannabis-related terpene concentration via a thermal desorption method. Four samples were collected for DRI analysis on 11-March. An additional eight microbial samples were collected on 15-April to determine if microbial generation is taking place in the Facility. Microbial samples were all collected within property boundaries, at locations within the greenhouse and processing areas, as well as outdoors. The outdoor sample is collected for comparison purposes to assess indoor versus outdoor differential and thus potential for microbial generation within the property. It should be noted that this region is dense with agriculture and other biogenic sources.

2.1 VOC AND CANNABIS TERPENE MEASUREMENTS

The SCS team collected VOC samples at locations indoors, during different cannabis processing operations (such as trimming and bucking) and in drying rooms; as well as outdoors, at locations up and downwind of the facility, under different meteorological conditions. Sampling exercises followed established EPA protocols and used recognized EPA and ASTM standards in determining concentration values in the samples collected. In summary, the primary methods employed in this field study are listed below:

- Speciated Volatile Organic Compounds (VOCs) via EPA TO-15
- Cannabis-specific terpenes –Thermal Desorption, DRI Method

The outdoor VOC sampling locations are shown in Figure 2. Indoor samples are all located inside the processing facility, and thus do not have GPS location. For every indoor location a TO-15 sample was collected, a cannabis terpene sample was also collected. Table 1 provides the VOC sampling details such as GPS location, time sampled, and relevant wind parameters.

Figure 2. VOC Sampling Locations

Table 1: VOC and Cannabis Terpene Sample Details

Sample ID	General Sample Info		Location			Approx. Wind Data	
	Date Sampled	Approx. Time	Latitude	Longitude	Notes	WS* [mph]	WD** [from]
Trimming***	11-Mar	10:59	Inside Processing Facility		Trimming; Strains: Animal Cookie, Wedding Crasher	N/A	N/A
Drying Room (2-day)***	11-Mar	11:24	Inside Processing Facility		2-day drying; Strains: Animal Cookie, Mimosa, Lemon OG, Gelato, Wedding Crasher	N/A	N/A
Drying Room (7-day)***	11-Mar	11:45	Inside Processing Facility		7-10 day drying; ready to be bucked; Strains: Wedding Crasher, Sunset Sherbert	N/A	N/A
Bucking***	11-Mar	13:30	Inside Processing Facility		Bucking Wedding Crasher	N/A	N/A
AM-UP	15-Apr	7:30	34°24'41.50"N	119°32'8.20"W	No winds	0	ENE
AM-DN1	15-Apr	7:56	34°24'31.70"N	119°32'21.70"W	Across from light construction; no winds	0	ENE
AM-DN2	15-Apr	7:45	34°24'29.90"N	119°32'15.00"W	Slight cannabis odor; no winds; at SE corner of GH with no plants	0	ENE
PM-UP	15-Apr	13:37	34°24'31.60"N	119°32'21.70"W	Observed winds 3 mph from SW	7	WSW
PM-DN1	15-Apr	13:20	34°24'42.50"N	119°32'13.30"W	Observed winds 2 mph from WSW	7	WSW
PM-DN2	15-Apr	13:15	34°24'41.10"N	119°32'7.00"W	Observed winds 1.7 mph from SW	7	WNW

* Wind Speed data from Wunderground data downloaded 16-April
** Wind Direction data from on-site meteorological system
*** Cannabis terpene sample also collected

2.2 MICROBIAL CONCENTRATION MEASUREMENTS

The SCS team collected microbial samples within the facility, during operations, as well as in the immediate vicinity of flowering and non-flowering cannabis in the greenhouse. The outdoor or greenhouse microbial sampling locations are shown in Figure 3 below. Indoor samples are all located inside the processing facility, and thus do not have GPS location. Table 2 provides sampling details such as GPS location, time sampled, and relevant wind parameters.

Figure 3. Microbial Sampling Locations

Table 2: Microbial Sample Details

Sample ID	General Sample Info		Location			Approx. Wind Data	
	Date Sampled	Approx. Time	Latitude	Longitude	Notes	WS* [mph]	WD** [from]
Outdoor 1	15-Apr	7:03	34°24'36.60"N	119°32'19.70"W	-	0	ENE
GH - Mothering	15-Apr	8:24	34°24'33.10"N	119°32'13.00"W	-	0	SW
GH - Flowering	15-Apr	8:39	34°24'32.80"N	119°32'11.50"W	-	0	SW
GH - Mature	15-Apr	8:55	34°24'32.30"N	119°32'8.90"W	-	0	WSW
Trimming	15-Apr	9:22	Inside Processing Facility		Outside of Camfil Filter	N/A	N/A
Trimming	15-Apr	9:36	Inside Processing Facility		Between Camfil Filters	N/A	N/A
Breakroom	15-Apr	9:58	Inside Processing Facility		-	N/A	N/A
Outdoor 2	15-Apr	10:17	34°24'36.60"N	119°32'19.70"W	-	5	WNW

* Wind Speed data from Wunderground data downloaded 16-April

** Wind Direction data from on-site meteorological system

3.0 FIELD AND ANALYTICAL METHODS USED

The following sections detail the methods utilized in the study.

3.1 FIELD SAMPLING METHODS

3.1.1 Field Sampling For VOCs

VOC samples were collected directly from the ambient air at breathing level in evacuated 5-liter Summa canisters and allowed to come to just under ambient pressure. Each sample was collected in under 1-minute. Samples were shipped to Atmospheric Analysis and Consulting, Inc. (AAC) and were analyzed for VOCs according to EPA TO-15, as well as TICs listed in Table 2 below. Field logs are provided in Appendix C.

Atmospheric Analysis and Consulting, Inc. (AAC Lab) was founded as an air quality laboratory in June of 1993 by Dr. Sucha Parmar in Ventura, California. AAC Lab is a privately-owned Small Minority Business certified through the Small Business Administration (SBA). AAC Lab holds NELAP and South Coast Air Quality Management District (SCAQMD) certifications.

An additional set of samples, to be analyzed for cannabis-specific terpenes, were collected via Tenax® tubes attached to low flow adapters at a rate of approximately 50 mL/min for 10 minutes. Flow was measured prior to and following each sample through the use of a BIOS DryCal primary flow standard. These samples were shipped to Desert Research Institute (DRI), a nonprofit research campus of the Nevada System of Higher Education that focuses on environmental research, for analysis via thermal desorption.

3.1.2 Field Sampling for Microbials

Microbial samples were collected with a spore trap cassette directly from the ambient air at breathing level. Using a BGI PQ100 pump, samples were collected in 10 minutes at a flow of 10 LPM. These were shipped to Eurofins EMLab P&K's South San Francisco lab for analysis. Eurofins EMLab P&K is a certified and accredited lab that adheres to the stringent ISO/IEC 17025:2005 guidelines.

3.2 ANALYTICAL METHODS EMPLOYED

3.2.1 Analytical Method for VOCs and Cannabis Terpenes

TO-15 is one of EPA's Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. This method is designed for samples collected in Summa® canisters and analyzed by gas chromatography/mass spectrometry (GCMS). VOCs are defined by the method as organic compounds having a vapor pressure greater than 10^{-1} Torr at 25°C and 760 mmHg. The method compound list includes 59 VOC's which are also identified as hazardous air pollutants (HAP's) in Title III of the Clean Air Act amendments of 1990. In addition to the 59 VOCs listed by the method as The Target Compound List, Tentatively Identified Compounds (TICs) were also analyzed for that include a library of over 250,000 compounds. The identification of TICs in the sample is not considered "absolute" or "confirmed" but rather an estimate. However, it is still a useful tool for identifying the presence of possible compounds above detection limits. In this case, many terpenes that are known to be emitted by cannabis plants can be identified as TICs. Table 3, below, contains a list of all analyzed VOCs. See Appendix A for further description of method.

Analysis of cannabis related terpenes was conducted by DRI via an internal method that utilizes thermal desorption for analysis.

3.2.1 Analytical Method for Microbial Samples

All microbial samples were analyzed by Spore Trap Analysis (EM-MY-S-1038, an AIHA-LAP, LLC accredited service), which quantifies a broad spectrum of both culturable and non-culturable fungal spores present, in spores/m^3, along with an assessment of general background debris. Samples are collected using an inertial impactor with air sampling cassettes and analyzed via microscopical techniques to examine spores and identify fungi. Error, or the level of uncertainty associated with spore trap samples varies from 30% – 200%, depending on the spore loadings of the cassettes. This analysis is not meant to determine the actual spore count, but rather, to identify the types of spores present in the air, as well as their concentration relative to each other and other collected samples.

Table 3: Complete List of Analyzed VOCs

TO-15 (VOC)							
CAS#	**Compound**		**CAS#**	**Compound**		**CAS#**	**Compound**
115-07-1	Propene		156-59-2	cis-1,2-Dichloroethene		111-65-9	n-Octane
75-71-8	Dichlorodifluoromethane (CFC 12)		141-78-6	Ethyl Acetate		127-18-4	Tetrachloroethene
74-87-3	Chloromethane		110-54-3	n-Hexane		108-90-7	Chlorobenzene
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)		67-66-3	Chloroform		100-41-4	Ethylbenzene
75-01-4	Vinyl Chloride		109-99-9	Tetrahydrofuran (THF)		179601-23-1	m,p-Xylenes
106-99-0	1,3-Butadiene		107-06-2	1,2-Dichloroethane		75-25-2	Bromoform
74-83-9	Bromomethane		71-55-6	1,1,1-Trichloroethane		100-42-5	Styrene
75-00-3	Chloroethane		71-43-2	Benzene		95-47-6	o-Xylene
64-17-5	Ethanol		56-23-5	Carbon Tetrachloride		111-84-2	n-Nonane
75-05-8	Acetonitrile		110-82-7	Cyclohexane		79-34-5	1,1,2,2-Tetrachloroethane
107-02-8	Acrolein		78-87-5	1,2-Dichloropropane		98-82-8	Cumene
67-64-1	Acetone		75-27-4	Bromodichloromethane		80-56-8	alpha-Pinene
75-69-4	Trichlorofluoromethane (CFC 11)		79-01-6	Trichloroethene		103-65-1	n-Propylbenzene
67-63-0	2-Propanol (Isopropyl Alcohol)		123-91-1	1,4-Dioxane		622-96-8	4-Ethyltoluene
107-13-1	Acrylonitrile		80-62-6	Methyl Methacrylate		108-67-8	1,3,5-Trimethylbenzene
75-35-4	1,1-Dichloroethene		142-82-5	n-Heptane		95-63-6	1,2,4-Trimethylbenzene
75-09-2	Methylene Chloride		10061-01-5	cis-1,3-Dichloropropene		100-44-7	Benzyl Chloride
107-05-1	3-Chloro-1-propene (Allyl Chloride)		108-10-1	4-Methyl-2-pentanone		541-73-1	1,3-Dichlorobenzene
76-13-1	Trichlorotrifluoroethane (CFC 113)		10061-02-6	trans-1,3-Dichloropropene		106-46-7	1,4-Dichlorobenzene
75-15-0	Carbon Disulfide		79-00-5	1,1,2-Trichloroethane		95-50-1	1,2-Dichlorobenzene
156-60-5	trans-1,2-Dichloroethene		108-88-3	Toluene		5989-27-5	d-Limonene
75-34-3	1,1-Dichloroethane		591-78-6	2-Hexanone		96-12-8	1,2-Dibromo-3-chloropropane
1634-04-4	Methyl tert-Butyl Ether		124-48-1	Dibromochloromethane		120-82-1	1,2,4-Trichlorobenzene
108-05-4	Vinyl Acetate		106-93-4	1,2-Dibromoethane		91-20-3	Naphthalene
78-93-3	2-Butanone (MEK)		123-86-4	n-Butyl Acetate		87-68-3	Hexachlorobutadiene

4.0 QUALITY ASSURANCE MEASURES AND DOCUMENTATION

The following sections detail some of the quality assurance measures utilized by this sampling and measurement program to ensure the defensibility of the data collected. These measures include lab control samples, and chains of custody documentation. Flow calibrations are not required or necessary for collection of TO-15 samples.

4.1 CHAIN OF CUSTODY DOCUMENTATION

The integrity and traceability of samples from the time they are collected through the time data are reported is essential in any sampling and analysis program. The handling of the samples and transfer of custody must be well documented. A sample is considered to be in one's custody if it meets any of the following criteria:

1. In actual possession or in view of the person who collected the sample.
2. Locked in a secure area.
3. Placed in an area restricted to authorized personnel.

4.1.1 Field Sample Custody and Documentation

In order to maintain the integrity and traceability of samples, all information pertinent to field sampling was recorded in field logs. All samples were properly labeled prior to transport to respective laboratories, and were accompanied by completed chain-of-custody documentation. All documentation was recorded in indelible ink. See Appendix C.

4.1.2 Sample Labeling

Sample labels are necessary to prevent misidentification of samples. Labels were completed and affixed to sample containers at the time of sample collection.

4.1.3 Chain-of-Custody Records

To establish the documentation necessary to trace the sample possession from the time of collection, a chain-of-custody record was completely filled out and accompanied every sample. See Appendix C for these records.

4.2 FLOW CALIBRATIONS

Flow calibrations are required for any sample that is collected on a filter or other media. Accurate flows are necessary for determination of sample volume and thus sample concentration. SCS utilized a BIOS primary flow calibrator for the setting and verification of microbial flow. For VOC terpene measurements, a BGI pump with certified mass flow meter was utilized to set flow rates.

5.0 SAMPLING RESULTS

The sections below provide the analytical results from the collected measurements. The following acronyms and abbreviations are used throughout the tables.

REL: Recommended Exposure Limit (NIOSH)

PEL: Permissible Exposure Limit (OSHA)

ND: Non-Detect

ppb: Parts Per Billion

ppm: Parts Per Million

INV: Invalid

µg: Microgram

m^3: Cubic Meter

SRL: Sample Reporting Limit

5.1 VOC AND CANNABIS TERPENE SAMPLING RESULTS

Table 4 provides the analytical results for TO-15 VOC samples. There were many VOC's analyzed for, listed in Section 3.2, above; however, tables only show the compounds that were detected in samples above Sample Reporting Limits (SRLs). The actual analytical results from Atmospheric Analysis and Consulting (AAC) are provided in Appendix B. In addition to concentration values, the Tables provide regulatory benchmarks for comparative purposes when available.

Table 5 provides the analytical results for the cannabis terpene samples collected inside the processing area. All of the results are provided in the table without exceptions.

Table 4: TO-15 VOCs Detected At Or Above Sample Reporting Limits

Compound / Sample ID	*NIOSH REL*	*OSHA PEL*	Indoor Samples				Outdoor Samples					
			Trimming	Drying 2-Day	Drying 7-Day	Bucking	AM-UP	AM-DN1	AM-DN2	PM-UP	PM-DN1	PM-DN2
VOC (ppb)	***[ppb]***	***[ppb]***	[ppb]	[ppb]	[ppb]	[ppb]	[ppb]	[ppb]	[ppb]	[ppb]	[ppb]	[ppb]
Propene	*N/A*	*100,000*	362	189	24.3	308	5.89	<SRL	<SRL	<SRL	<SRL	<SRL
Chloromethane	-	*100,000*	<SRL	<SRL	<SRL	<SRL	<SRL	<SRL	<SRL	<SRL	0.77	<SRL
Methanol	*200,000*	*200,000*	93.9	843	727	62.5	<SRL	12.6	8.84	<SRL	11.2	10.2
1,3-Butadiene	*N/A*	*1,000*	<SRL	<SRL	<SRL	<SRL	2.74	<SRL	<SRL	<SRL	<SRL	<SRL
Ethanol	*1,000,000*	*1,000,000*	148	806	989	141	<SRL	<SRL	<SRL	<SRL	<SRL	10.9
Acetone	*250,000*	*1,000,000*	266	234	205	231	<SRL	<SRL	<SRL	<SRL	<SRL	<SRL
2-Propanol (IPA)	*400,000*	*400,000*	4250	2210	2360	4660	<SRL	<SRL	4.00	<SRL	<SRL	<SRL
Carbon Disulfide	*1,000*	*20,000*	<SRL	<SRL	<SRL	<SRL	<SRL	<SRL	<SRL	<SRL	<SRL	1.81
2-Butanone (MEK)	*200,000*	*200,000*	<SRL	4.35	4.16	<SRL	<SRL	<SRL	<SRL	<SRL	<SRL	<SRL
Ethyl Acetate	*400,000*	*400,000*	<SRL	5.40	2.44	<SRL	<SRL	<SRL	<SRL	<SRL	<SRL	<SRL
Tetrahydrofuran	*200,000*	*200,000*	1.9	1.98	1.87	2.46	<SRL	<SRL	<SRL	<SRL	<SRL	<SRL
Benzene	*100*	*1,000*	<SRL	1.75	<SRL	<SRL	<SRL	<SRL	<SRL	<SRL	<SRL	<SRL
Toluene	*100,000*	*200,000*	<SRL	4.58	1.41	<SRL	<SRL	<SRL	<SRL	<SRL	<SRL	<SRL
TICs (ppb)	***[ppb]***	***[ppb]***	[ppb]	[ppb]	[ppb]	[ppb]	[ppb]	[ppb]	[ppb]	[ppb]	[ppb]	[ppb]
Isobutane	*800,000*	*N/A*	31.2	ND	ND	24.9	ND	0.86	0.82	ND	ND	ND
Butane	*800,000*	*N/A*	ND	ND	ND	ND	ND	3.57	ND	ND	ND	ND
2-Methylbutane	-	-	ND	ND	ND	ND	ND	2.14	0.84	ND	ND	ND
Pentane	*120000*	*1000000*	11.3	ND	ND	11.6	ND	0.77	ND	ND	ND	ND
alpha-Pinene	*100,000*	*100,000*	23.0	144	175	11.8	ND	ND	2.49	ND	ND	ND
Camphene	-	-	10.7	88.3	115	ND	ND	ND	ND	ND	ND	ND
beta-Pinene	*N/A*	*N/A*	83.2	125	150	46.9	ND	ND	ND	ND	ND	ND
Decane	-	-	ND	ND	ND	ND	ND	ND	0.69	ND	ND	ND

Compound / Sample ID	*NIOSH REL*	*OSHA PEL*	Indoor Samples				Outdoor Samples					
			Trimming	Drying 2-Day	Drying 7-Day	Bucking	AM-UP	AM-DN1	AM-DN2	PM-UP	PM-DN1	PM-DN2
1-Methyl-4-(1-methylethyl)-1,3-cyclohexadiene	-	-	13.9	104	91.3	ND	ND	ND	ND	ND	ND	ND
1-Methyl-(1-methylethyl)-benzene	-	-	13.0	ND	ND	ND	ND	ND	0.89	ND	ND	ND
Limonene	*N/A*	*N/A*	140	738	729	68.3	ND	ND	2.57	ND	ND	ND
Napthalene	*10,000*	*10,000*	ND	ND	ND	ND	ND	ND	0.84	ND	ND	ND
4-Carene	-	*N/A*	19.6	159	147	ND	ND	ND	ND	ND	ND	ND
1-Methyl-4-(10-methylethenyl)-benzene	-	-	10.1	ND	ND	ND	ND	ND	ND	ND	ND	ND
beta-Myrcene	-	-	ND	453	592	ND	ND	ND	ND	ND	ND	ND
3,7-Dimethyl-1,3,6-octatriene	-	-	ND	96.8	100	ND	ND	ND	ND	ND	ND	ND
1-Methyl-4-(1-methylethyl)-1,4-cyclohexadiene	-	-	ND	69.9	ND	ND	ND	ND	ND	ND	ND	ND
Caryophyllene	-	-	ND	71.5	125	ND	ND	ND	ND	ND	ND	ND
C10H16 Hydrocarbon	-	-	ND	ND	91.1	ND	ND	ND	ND	ND	ND	ND
C15H24 Hydroarbon #1	-	-	ND	ND	ND	20.0	ND	ND	ND	ND	ND	ND
C15H24 Hydroarbon #2	-	-	ND	ND	ND	21.2	ND	ND	ND	ND	ND	ND
C15H24 Hydroarbon #3	-	-	ND	ND	ND	23.1	ND	ND	ND	ND	ND	ND
C15H24 Hydroarbon #4	-	-	ND	ND	ND	24.2	ND	ND	ND	ND	ND	ND
C15H24 Hydroarbon #5	-	-	ND	ND	ND	39.3	ND	ND	ND	ND	ND	ND

Table 5: Cannabis Terpene Sampling Results

Compound / Sample ID	Bucking	Drying 2-Day	Drying 7-Day	Trimming
Terpene (ug/m^3)	[ug/m^3]	[ug/m^3]	[ug/m^3]	[ug/m^3]
alpha-Pinene	24.05	189	24.3	308
Camphene	1.04	275.20	265.76	8.35
beta-Pinene	29.53	2294.49	2031.10	103.16
beta-Myrcene	398.79	20953.83	20705.40	1054.04
Delta-3-Carene	ND	ND	ND	ND
alpha-Terpinene	ND	63.53	ND	ND
para-Cymene	2.39	26.20	6.27	5.83
D-Limonene	413.28	30521.38	21506.84	1302.60
Eucalyptol	10.36	ND	ND	13.33
Trans-beta-Ocimene	ND	881.75	431.91	85.87
cis-beta-Ocimene	4.20	2204.96	1258.37	17.58
gamma-Terpinene	ND	ND	60.58	ND
Terpinolene	2.72	412.07	266.87	6.99
Linalool	2.61	322.02	750.19	8.04
Isopulegol	ND	ND	ND	ND
Geraniol	ND	ND	ND	ND
beta-Caryophyllene	55.56	2456.28	2987.69	69.85
alpha-Humulene	16.81	616.18	782.32	12.81
D-Nerolidol	ND	ND	ND	ND
E-Nerolidol	ND	ND	ND	ND
Caryophyllene oxide	ND	ND	ND	ND
Guaiol	ND	ND	ND	ND
Alpha-Bisabolol	ND	ND	ND	ND

5.2 MICROBIAL SAMPLING RESULTS

There were 23 spore types analyzed for, but only 17 detected across the eight samples. Table 5 provides the results of only the detected spore types in their raw count and concentration; while Table 6 identifies and classifies where each spore type is found. Additional information can be found in Appendix A, while the analytical lab results from EMLab P&K are provided in Appendix B.

5.2.1 Indoor vs Outdoor Comparison

This region is home to a number of different agricultural operations, consisting of multiple types of soils, vegetation of varying growth and decay stages, fertilizers and other nutrients, among other biological factors, that generate microbial spores of their own. For this reason, outdoor samples are required as a measure of background concentrations to properly determine if the Facility itself is a significant source of microbial generation. In this case, we are looking for significant increases in microbial concentrations relative to background concentrations.

Table 6: Microbial Sampling Results

Sample Location / Spore Type	Outdoor AM		GH, Mothering		GH, Flowering		GH, Mature		Trimming, outside filter		Trimming, btwn filter		Breakroom		Outdoor PM	
	Raw Ct.	Spores / m³	Raw Ct.	Spores / m³	Raw Ct.	Spores / m³	Raw Ct.	Spores / m³	Raw Ct.	Spores / m³	Raw Ct.	Spores / m³	Raw Ct.	Spores / m³	Raw Ct.	Spores / m³
Alternaria	1	10	-	-	-	-	6	60	-	-	-	-	-	-	12	120
Ascospores	84	3,400	57	2,300	57	2,300	61	2,400	3	120	5	200	1	40	81	3,200
Basidiospores	228	9,100	147	5,900	141	5,600	168	6,700	1	40	6	240	2	80	154	6,200
Botrytis	-	-	-	-	14	140	1	10	-	-	-	-	-	-	6	60
Chaetomium	-	-	-	-	1	10	-	-	-	-	-	-	-	-	-	-
Cladosporium	156	6,200	123	4,900	127	5,100	148	5,900	26	1,000	28	1,100	8	320	163	6,500
Epicoccum	-	-	-	-	-	-	3	30	-	-	-	-	-	-	-	-
Oidium	-	-	-	-	-	-	-	-	74	3,000	215	8,600	11	110	4	40
Other brown	-	-	-	-	-	-	2	20	-	-	-	-	-	-	2	20
Penicillium / Aspergillus types	63	2,500	38	1,500	48	1,900	20	800	29	1,200	37	1,500	29	1,200	27	1,100
Smuts, Periconia, Myxomycetes	1	10	5	50	1	10	-	-	-	-	1	10	-	-	11	110
Torula	-	-	1	10	1	10	-	-	-	-	-	-	-	-	-	-
Ulocladium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	10
Background Debris	3+	-	3+	-	3+	-	3+	-	3+	-	3+	-	3+	-	3+	-
Hyphal fragments/m³	40	-	20	-	10	-	10	-	100	-	420	-	20	-	60	-
Pollen/m³	10	-	20	-	10	-	<10	-	<10	-	<10	-	<10	-	60	-
Skin cells	<1+	-	<1+	-	<1+	-	1+	-	3+	-	1+	-	2+	-	<1+	-
Sample volume	100	-	100	-	100	-	100	-	100	-	100	-	100	-	100	-
Total Spores		**21,000**		**15,000**		**15,000**		**16,000**		**5,300**		**12,000**		**1,700**		**17,000**

Table 7: Fungal Glossary

Spore Type	Where Found
Alternaria	Soil, dead organic debris, on food stuffs and textiles. Plant pathogen, most commonly on weakened plants
Ascospores	Saprophytes and plant pathogens. Found everywhere in nature.
Basidiospores	Saprophytes and plant pathogens. Gardens, forests, woodlands.
Chaetomium	Soil, seeds, cellulose substrates, dung, woody and straw materials.
Cladosporium	Soil of many different types, plant litter, plant pathogen, leaf surfaces, old or decayed plants.
Epicoccum	Plant debris, soil. Secondary invader of damaged plant tissue.
Penicillium / Aspergillus types	Soil, decaying plant debris, compost piles, fruit rot. P. glabrum has been isolated from diesel fuel.
Smuts, Periconia, Myxomycetes	Decaying logs, stumps and dead leaves, particularly in forested regions.
Ulocladium	Soil, dung, paint, grasses, fibers, wood, decaying plant material, paper, and textiles.

6.0 CONCLUSIONS AND DATA LIMITATIONS

None of the samples collected during the course of this sampling project exceeded published NIOSH or OSHA exposure standards. The following sections provide discussions in regards to the sampling results.

6.1 CONCLUSIONS

The following provide some conclusions based upon the three types of sampling conducted. Please note the data limitations in Section 6.3 when reviewing this section.

6.1.1 VOC Sampling

All of the TO-15 area samples collected had measured concentrations of VOCs that were either below the limits of detection or significantly below the published NIOSH RELs and/or OSHA PELs. These samples were all representative of background concentrations in the area.

- The measured concentrations do not indicate the presence of a possible health concern in relation to employees or receptors downwind from the facility.
- Beta-Myrcene and d-Limonene are two terpenes identified to be significantly elevated in the drying rooms. NIOSH and OSHA **do not** have health standards related to beta-Myrcene or d-Limonene. NIOSH and OSHA do have health standards for a related terpene alpha-pinene (100,000 ppb), but the estimated concentration is at least three orders of magnitude below this standard. In addition, the drying room samples were taken directly in the vicinity (within 1 foot) of drying plants, in an enclosed room where workers spend very limited time.
- Concentrations of downwind samples were almost all less than the SRL for every compound. In addition, there was no appreciable difference in downwind vs. upwind samples relative to the measured VOC's.

6.1.2 Cannabis Terpene Sampling

Cannabis terpene measurements were collected in the indoor processing areas to assess relative concentrations based on type of processing taking place and location of the sample. This sampling indicated that the drying rooms had the greatest concentrations of cannabis terpenes in the air. This was to be expected due to the fact the rooms are well sealed and are tightly packed with cannabis plants in various stages of drying. The sampling also indicated that the scrubbing system being utilized in the processing area has some effectiveness at reducing total Terpene concentration within the processing building.

6.1.3 Microbial Sampling

The following provide some conclusions relative to the microbial sampling event.

- All of the samples collected indoors show a reduction in microbial concentration compared to measured outdoor levels. This shows that indoor microbial generation is not significant relative to background levels in these areas.

- Ascospores, Basidiospores, Cladosporium, and Penicillium / Aspergillus types are four microbial spore types found across all eight samples. These spore types are ubiquitous in nature.

- Basidiospores were consistently the spore type found in the highest concentration in the three greenhouse samples. This is a plant pathogen that is often found in gardens, forests, and woodlands. In addition, outdoor concentrations were in the same range as in the greenhouse indicating local generation was not significant.

- Conversely, Oidium was not found in any of the three greenhouse samples or was found in low concentrations outdoors, but was present in the highest concentration in the trimming room samples. This indicates that the trimming and bucking of dried plant is a source of Oidium in the processing area. Oidium is an Erysiphe species. Erysiphe species are plant pathogens, one of the genera causing powdery mildews. Erysiphe is very common and is an obligate parasite on leaves, stems, flowers, and fruits of living higher plants. No information is available regarding health effects or toxicity. Allergenicity has not been studied. The asexual spores are also seen in dust as part of the normal influx of outdoor microbial particles.

6.2 EXPOSURE LIMITS

There is often confusion between exposure limits put out by different agencies even within the same administration. For example, the National Institute for Occupational Safety and Health (NIOSH) establishes Recommended Exposure Limits (RELs) whereas the Occupational Safety and Health Administration (OSHA) issues Permissible Exposure Limits (PELs).

NIOSH RELs are supposed to be based on the best available science (using human or animal health effects data). According to the CDC's website, "To the extent feasible, NIOSH will project not only a no-effect exposure, but also exposure levels at which there may be residual risks. This policy applies to all workplace hazards, including carcinogens, and is responsive to Section 20(a)(3) of the Occupational Safety and Health Act of 1970, which charges NIOSH to '… .describe exposure levels that are safe for various periods of employment, including but not limited to the exposure levels at which no employee will suffer impaired health or functional capacities or diminished life expectancy as a result of his work experience.'"

OSHA PELs, on the other hand, are subject to the rulemaking and political process, meaning that the interests of all parties involved are taken into consideration. Thus, OSHA does not have the luxury of relying strictly on science. Establishing PELs sometimes may come down to court rulings.

NIOSH Recommended Exposure Limits (RELs):

These values are TWA concentrations for up to a 10-hour workday during a 40-hour workweek.

OSHA Permissible Exposure Limits (PELs):

These values are TWA concentrations for up to an 8-hour workday during a 40-hour workweek.

6.3 DATA LIMITATIONS

There are several limitations associated with this sampling project. The major limitations are as follows:

- The results correspond to one particular period of time. These results may not necessarily be reproducible at another given period of time.
- Data obtained during this sampling project are averaged concentrations over short terms (Approximately 10 minutes). Different averaging periods may lead to different results.
- Outdoor pollutant concentrations are highly dependent on dispersion parameters (i.e. winds, relative humidity, proximity to source).

DUDEK
621 CHAPALA STREET
SANTA BARBARA, CALIFORNIA 93101
T 805.963.0651 F 805.963.2074

December 9, 2021 13971

Brandon Gesicki
Canna Rios, LLC
PO Box 22347
Carmel, CA 93922

Subject: Greenhouse Gas Emissions Technical Memorandum for the Canna Rios, LLC Cannabis Cultivation Project

Dear Brandon Gesicki:

Dudek has prepared a greenhouse gas (GHG) emissions technical memorandum for the Canna Rios, LLC (applicant) Cannabis Cultivation Project (project) in Santa Barbara County, California. This memorandum evaluates the project's GHG emissions from mobile source operations. The contents and organization of this memorandum are as follows: project description, general analysis and methodology, thresholds of significance and impact analysis for the GHG emissions assessment, conclusions, and references cited.

1 Project Description

The Project includes a request for approval of a Land Use Permit to allow 46.29 acres of outdoor cannabis cultivation and 1.45 acres of cannabis nursery. The outdoor cannabis cultivation area will include 35.95 acres of hoop structures (18 feet in width/300 feet in length) and the cannabis nursery area will include 0.95 acres of hoop structures (20 feet in width/147-248 feet in length). Hoop structures will have a maximum height of 16 feet and will not include any permanent structural elements, utilities, or lighting. The operation will involve two harvests per year for a duration of approximately three weeks per harvest, not to exceed four weeks per harvest. All harvested cannabis will be transferred off site for processing the same day it is harvested. There will be no processing (i.e., drying, curing, trimming, storing, packaging, or labeling) of harvested cannabis on the Project site. The total cannabis cultivation area (as defined by the LUDC) will be approximately 47.74 acres in size.

The secure cannabis operational area will also include a 0.67-acre compost and waste area, 0.64 total acres of compacted soil parking and general agricultural equipment storage area, and a 0.50-acre transport staging (packing and shipping) area. The transport staging area will be used for weighing and recording, boxing, and vehicle loading for movement of cannabis offsite. The Project also includes five 280-sq. ft. storage containers and a 224 sq. ft. temporary office trailer. The five storage containers will be used for general material/equipment storage and pesticide/chemical storage, and will not hold any cannabis plant or product. The temporary office trailer will be permitted for a maximum of one year following land use permit issuance, after which time the trailer will be removed from the site, not to return. The project will not include any grading in excess of 50 cubic yards. The project will not include any tree removal or native vegetation removal.

The proposed cannabis operation will be secured with 6-foot-high “no-climb” chain link fencing along the perimeter of the proposed cannabis operational area. Access to the proposed cannabis operation will be controlled with 6-foot high, 20-foot-wide “no-climb” chain link gates that will remain locked at all times except during times of active ingress/egress. Additional security features include security cameras and security lighting that will be installed around the perimeter and throughout the cannabis operational area. All light fixtures will be fully shielded and directed downward, and installed at a maximum height of 10 ft. All light fixtures will be motion activated, and when triggered, will remain on for a maximum of six minutes. Screening will be provided by approximately 127,899 sq. ft. of landscaping planted along portions of the western, eastern and southern project boundaries.

The proposed cannabis operation will involve a maximum of 24 regular full-time employees and a maximum of 43 additional seasonal employees who will be employed on site for a maximum of 60 days per year during planting and harvest periods. The hours of operation will be 6:30 a.m. to 4:30 p.m. Monday through Friday.

An existing onsite groundwater well will provide irrigation water for the Project. All sanitation facilities will be provided in compliance with OSHA. Fire protection will be provided by the Santa Barbara County Fire Department, law enforcement will be provided by the Santa Barbara County Sheriff’s Department, and electricity will be provided by Pacific Gas & Electric Co. The project will not include the use of generators.

The Project site is accessed via White Rock Lane, an existing 25-foot wide private road off of Santa Maria Mesa Road. The Project site is on a 431.4-acre lot, zoned Agriculture II (AG-II-100) and shown as Assessor's Parcel Numbers 129-040-010, -018, and 129-030-022, located at 4651 Santa Maria Mesa Road in the unincorporated area of Santa Maria, 5th Supervisorial District.

2 General Analysis and Methodology

The proposed project location is in the South Central Coast Air Basin and is within the jurisdictional boundaries of the Santa Barbara County Air Pollution Control District (SBCAPCD). Emission calculations for mobile sources were estimated using the California Emissions Estimator Model (CalEEMod) Version 2020.4.0 (CAPCOA 2021) which rely on emissions factors from the California Air Resources Board (CARB) mobile-source emissions inventory model, EMFAC2017 (CARB 2018).

GHGs are gases that absorb infrared radiation in the atmosphere. The greenhouse effect is a natural process that contributes to regulating the Earth’s temperature. Global climate change concerns are focused on whether human activities are leading to an enhancement of the greenhouse effect. Principal GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), O_3, and water vapor. If the atmospheric concentrations of GHGs rise, the average temperature of the lower atmosphere will gradually increase. Globally, climate change has the potential to impact numerous environmental resources through uncertain impacts related to future air temperatures and precipitation patterns. Although climate change is driven by global atmospheric conditions, climate change impacts are felt locally. Climate change is already affecting California: average temperatures have increased, leading to more extreme hot days and fewer cold nights; shifts in the water cycle have been observed, with less winter precipitation falling as snow, and both snowmelt and rainwater running off earlier in the year; sea levels have risen; and wildland fires are becoming more frequent and intense due to dry seasons that start earlier and end later (CAT 2010).

The effect each GHG has on climate change is measured as a combination of the mass of its emissions and the potential of a gas or aerosol to trap heat in the atmosphere, known as its global warming potential (GWP), which varies among GHGs. Total GHG emissions are expressed as a function of how much warming would be caused by the same mass of CO_2. Thus, GHG emissions are typically measured in terms of pounds or tons of CO_2 equivalent (CO_2e).[1]

Global climate change is a cumulative impact; a project participates in this potential impact through its incremental contribution combined with the cumulative increase of all other sources of GHGs (CAT 2010). This approach is consistent with the Final Statement of Reasons for Regulatory Action for amendments to the California Environmental Quality Act (CEQA) Guidelines, which confirms that an environmental impact report (EIR) or other environmental document must analyze the incremental contribution of a project to GHG levels and determine whether those emissions are cumulatively considerable (CNRA 2009).

Mobile Sources

Mobile sources for the project would primarily be motor vehicles (automobiles, light-duty trucks, and heavy-duty trucks) traveling to and from the project site. Motor vehicles may be fueled with gasoline, diesel, or alternative fuels. In accordance with the Traffic Demand Management Plan (TDMP) for the project, there would be 24 employee roundtrips per day during normal operation and 67 employee roundtrips per day during harvest (60 days per year) (Joshua S. Blair Drafting and Design 2021). There would also be two heavy-duty truck roundtrips per day during harvest. The trucks will deliver the harvest King City with a 123-mile one-way distance. The emissions from the entire trip to King City and back was conservatively assumed to take place within the SCCAB. The project is proposed to operate six days per week. The CalEEMod was used to estimate GHG emissions from mobile sources from the project. Default emission rates and trip characteristics were used where project specific information was not available.

3 Thresholds of Significance and Impact Analysis

3.1 Thresholds of Significance

3.1.1 CEQA Guidelines

The California Natural Resources Agency adopted amendments to the CEQA Guidelines on December 30, 2009, which became effective on March 18, 2010. With respect to GHG emissions, the amended CEQA Guidelines state in Section 15064.4(a) that lead agencies should "make a good faith effort, to the extent possible on scientific and factual data, to describe, calculate or estimate" GHG emissions. The CEQA Guidelines note that an agency may identify emissions by either selecting a "model or methodology" to quantify the emissions or by relying on "qualitative analysis or other performance based standards" (14 CCR 15064.4(a)). Section 15064.4(b) of the CEQA

[1] The CO_2e for a gas is derived by multiplying the mass of the gas by the associated GWP, such that metric tons (MT) of CO_2e = (metric tons of a GHG) × (GWP of the GHG). CalEEMod assumes that the GWP for CH_4 is 25, which means that emissions of 1 MT CH_4 are equivalent to emissions of 25 MT CO_2, and the GWP for N_2O is 298, based on the Intergovernmental Panel on Climate Change's Fourth Assessment Report (IPCC 2007).

Guidelines states that the lead agency should consider the following when assessing the significance of impacts from GHG emissions on the environment:

- The extent a project may increase or reduce GHG emissions as compared to the existing environmental setting.
- Whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project.
- The extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions.

In addition, Section 15064.7(c) of the CEQA Guidelines specifies that "[w]hen adopting thresholds of significance, a lead agency may consider thresholds of significance previously adopted or recommended by other public agencies, or recommended by experts, provided the decision of the lead agency to adopt such thresholds is supported by substantial evidence." Similarly, the revisions to Appendix G, Environmental Checklist Form, which is often used as a basis for lead agencies' selection of significance thresholds, do not prescribe specific thresholds.

Rather, the CEQA Guidelines establish two new CEQA thresholds related to GHGs, which will be used in this memorandum to discuss the significance of project impacts (14 CCR 15000 et seq., Appendix G):

1. Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?
2. Would the project conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

Accordingly, the CEQA Guidelines do not prescribe specific methodologies for performing an assessment, establish specific thresholds of significance, or mandate specific mitigation measures. Rather, the CEQA Guidelines emphasize the lead agency's discretion to determine the appropriate methodologies and thresholds of significance that are consistent with the manner in which other impact areas are handled in CEQA (CNRA 2009).

3.1.2 Local Guidance

County Environmental Thresholds

The County of Santa Barbara adopted the ECAP in 2015 as a GHG emission reduction plan. The County has been implementing the plan's emission reduction measures since 2016. However, the County is not projected to meet the 2020 GHG emission reduction goal contained within the plan, and the plan is currently being updated. Therefore, the Board adopted Interim GHG Emissions CEQA Thresholds of Significance in January 2021 (County of Santa Barbara 2021). In July 2020, the Board affirmed its target to reduce GHG emissions in unincorporated County areas by 50 percent below 2007 levels by 2030. This target is in line with the State's goal of reducing statewide emissions by 40 percent below 1990 levels by 2030. The County developed the interim thresholds based on the County's 2030 GHG target, which are in line with the State's GHG emission reduction goals. The County developed the interim project-level threshold by determining the portion of the County's 2030 GHG target emissions level that may be attributed to new development. The Board adopted a numeric Screening Threshold of 300 MT CO_2e per year for non-industrial stationary source projects and plans. The recommended Screening Threshold results in approximately 15 percent of all applicable future projects, and 87 percent of all applicable future land use emissions, being subject to the Significance Threshold. Approximately 85 percent of future projects will fall below the Screening Threshold and, therefore, will not require further analysis.

For the purposes of this focused GHG assessment, the estimated GHG emissions from the mobile sources from the project are compared to the County's screening threshold for non-industrial projects of 300 MT CO_2e per year.

3.2 Impact Analysis

Operation of the project would generate GHG emissions through motor vehicle trips to and from the project site and during harvest. The project will have 24 regular full-time employees and a maximum of 43 seasonal employees for harvest, which will occur 60 days per year. The project will also have two daily truck trips during harvest. While the project will implement a Transportation Demand Management Plan to reduce the Project's employee trips through carpooling and other trip reducing measures, this analysis uses the most conservative scenario and assumes that each full time and seasonal employee would generate two daily trips. The GHG emissions from motor vehicle trips calculated using the CalEEMod in accordance with the methodology presented in Section 2 is presented in Table 1.

Table 1 Estimated Annual Operational GHG Emissions

Emission Source	CO_2	CH_4	N_2O	CO_2e
	Metric Tons per Year			
Full-time employees	36.32	0.00	0.00	36.75
Harvest employees	12.51	0.00	0.00	12.66
Harvest trucks	46.17	0.00	0.00	48.45
			Total	**97.86**
			Significance threshold	**300**
			Exceeds significance threshold?	**No**

Source: Attachment A.
Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent.
See Attachment A for complete results.

As shown in Table 1, emissions from mobile sources from the project would result in 98 MT CO_2e per year. This would not exceed the County of Santa Barbara's interim screening threshold of 300 MT CO_2e per year. Impacts from mobile sources would be considered less than significant. The project will implement a Transportation Demand Management Program in which carpooling and other trip reducing measures will be implemented which will further reduce GHG emissions from this source. In accordance with the County's Environmental Guidelines, land uses with irregular or seasonal trip making characteristics, such as wineries or special event centers, should apply an annual average daily trip rate (County of Santa Barbara 2021). In accordance with the Institute of Transportation Engineers Trip Generation 10th edition, the harvest trucks would have a passenger car equivalent of 3.0. The average daily trip rate for the project would then be 67 which is fewer than the County's screening criteria of 110 average daily trips.

4 Conclusions

Estimated project-generated mobile source operational GHG emissions would be approximately 98 MT CO_2e per year, which is below the County's interim screening threshold of 300 MT CO_2e per year. Accordingly, potential cumulative GHG impacts associated with the mobile sources for the project would be less than significant.

Sincerely,

Adam Poll, QEP, LEED AP BD+C
Senior Air Quality Specialist

Att.: *A, CalEEMod Outputs*
cc: *Amy Steinfeld, Brownstein Hyatt Farber Schreck, LLP*

5 References

CAPCOA (California Air Pollution Control Officers Association). 2021. CalEEMod 2020.4.0. May. Accessed December 2021. http://caleemod.com/.

CARB (California Air Resources Board). 2018. EMFAC2017. Accessed December 2021. https://arb.ca.gov/emfac/.

CNRA (California Natural Resources Agency). 2009. Final Statement of Reasons for Regulatory Action: Amendments to the State CEQA Guidelines Addressing Analysis and Mitigation of Greenhouse Gas Emissions Pursuant to SB97. December 2009. Accessed December 2021. http://resources.ca.gov/ceqa/docs/Final_Statement_of_Reasons.pdf.

Joshua S. Blair Drafting and Design. 2021. Traffic and Access Plan TP-1. August 6.

County of Santa Barbara. 2021. Environmental Thresholds and Guidelines Manual. January. Accessed December 2021. https://cosantabarbara.app.box.com/s/vtxutffe2n52jme97lgmv66os7pp3lm5.

Attachment A – CalEEMod Outputs

Canna Rios, LLC Cannabis Cultivation Project

Santa Barbara County APCD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Manufacturing	1.00	1000sqft	0.02	1,000.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.9	**Precipitation Freq (Days)**	37
Climate Zone	4			**Operational Year**	2022
Utility Company	Pacific Gas and Electric Company				
CO2 Intensity (lb/MWhr)	203.98	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Surrogate land use, not used for calculations.

Construction Phase - Based on TDMP.

Off-road Equipment - Mobile sources only.

Off-road Equipment - Mobile sources only.

Trips and VMT - Based on TDMP.

On-road Fugitive Dust - CalEEMod defaults.

Vehicle Trips - Calculated in construction.

Energy Use - Mobile sources only.

Water And Wastewater - Mobile sources only.

Solid Waste - Mobile sources only.

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	100.00	312.00
tblConstructionPhase	NumDays	100.00	60.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	PhaseEndDate	1/14/2022	12/31/2022
tblConstructionPhase	PhaseEndDate	1/17/2022	3/25/2022
tblEnergyUse	LightingElect	3.08	0.00
tblEnergyUse	NT24E	3.70	0.00
tblEnergyUse	NT24NG	6.67	0.00
tblEnergyUse	T24E	1.32	0.00
tblEnergyUse	T24NG	19.51	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	PhaseName		Full-Time Employees
tblOffRoadEquipment	PhaseName		Harvest
tblOffRoadEquipment	PhaseName		Full-Time Employees
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblSolidWaste	SolidWasteGenerationRate	1.24	0.00
tblTripsAndVMT	HaulingTripLength	20.00	123.00
tblTripsAndVMT	HaulingTripNumber	0.00	240.00
tblTripsAndVMT	WorkerTripNumber	0.00	48.00
tblTripsAndVMT	WorkerTripNumber	0.00	86.00
tblVehicleTrips	ST_TR	6.42	0.00

tblVehicleTrips	SU_TR	5.09	0.00
tblVehicleTrips	WD_TR	3.93	0.00
tblWater	IndoorWaterUseRate	231,250.00	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.0306	0.1551	0.2391	9.8000e-004	0.0748	1.5400e-003	0.0763	0.0200	1.4600e-003	0.0214	0.0000	95.0050	95.0050	5.0700e-003	9.1700e-003	97.8641
Maximum	**0.0306**	**0.1551**	**0.2391**	**9.8000e-004**	**0.0748**	**1.5400e-003**	**0.0763**	**0.0200**	**1.4600e-003**	**0.0214**	**0.0000**	**95.0050**	**95.0050**	**5.0700e-003**	**9.1700e-003**	**97.8641**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.0306	0.1551	0.2391	9.8000e-004	0.0748	1.5400e-003	0.0763	0.0200	1.4600e-003	0.0214	0.0000	95.0050	95.0050	5.0700e-003	9.1700e-003	97.8641
Maximum	**0.0306**	**0.1551**	**0.2391**	**9.8000e-004**	**0.0748**	**1.5400e-003**	**0.0763**	**0.0200**	**1.4600e-003**	**0.0214**	**0.0000**	**95.0050**	**95.0050**	**5.0700e-003**	**9.1700e-003**	**97.8641**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	**1-3-2022**	**4-2-2022**	0.1578	0.1578
2	**4-3-2022**	**7-2-2022**	0.0086	0.0086
3	**7-3-2022**	**9-30-2022**	0.0085	0.0085
		Highest	0.1578	0.1578

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	5.0700e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**5.0700e-003**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	5.0700e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**5.0700e-003**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Full-Time Employees	Building Construction	1/3/2022	12/31/2022	6	312	
2	Harvest	Building Construction	1/15/2022	3/25/2022	6	60	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Full-Time Employees	Cranes	0	4.00	231	0.29
Harvest	Cranes	0	4.00	231	0.29
Full-Time Employees	Concrete/Industrial Saws	0	8.00	81	0.73
Full-Time Employees	Forklifts	0	6.00	89	0.20
Harvest	Forklifts	0	6.00	89	0.20
Harvest	Graders	0	8.00	187	0.41
Full-Time Employees	Rubber Tired Dozers	0	1.00	247	0.40
Full-Time Employees	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Harvest	Tractors/Loaders/Backhoes	0	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Full-Time Employees	0	48.00	0.00	0.00	8.30	6.40	20.00	LD_Mix	HDT_Mix	HHDT
Harvest	0	86.00	0.00	240.00	8.30	6.40	123.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Full-Time Employees - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0207	0.0156	0.1588	4.0000e-004	0.0463	2.4000e-004	0.0465	0.0123	2.3000e-004	0.0125	0.0000	36.3199	36.3199	1.5200e-003	1.3200e-003	36.7520
Total	**0.0207**	**0.0156**	**0.1588**	**4.0000e-004**	**0.0463**	**2.4000e-004**	**0.0465**	**0.0123**	**2.3000e-004**	**0.0125**	**0.0000**	**36.3199**	**36.3199**	**1.5200e-003**	**1.3200e-003**	**36.7520**

3.2 Full-Time Employees - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0207	0.0156	0.1588	4.0000e-004	0.0463	2.4000e-004	0.0465	0.0123	2.3000e-004	0.0125	0.0000	36.3199	36.3199	1.5200e-003	1.3200e-003	36.7520
Total	**0.0207**	**0.0156**	**0.1588**	**4.0000e-004**	**0.0463**	**2.4000e-004**	**0.0465**	**0.0123**	**2.3000e-004**	**0.0125**	**0.0000**	**36.3199**	**36.3199**	**1.5200e-003**	**1.3200e-003**	**36.7520**

3.3 Harvest - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.7600e-003	0.1342	0.0256	4.5000e-004	0.0126	1.2100e-003	0.0138	3.4500e-003	1.1500e-003	4.6100e-003	0.0000	46.1710	46.1710	3.0300e-003	7.3900e-003	48.4491
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.1400e-003	5.3700e-003	0.0547	1.4000e-004	0.0159	8.0000e-005	0.0160	4.2300e-003	8.0000e-005	4.3100e-003	0.0000	12.5141	12.5141	5.2000e-004	4.6000e-004	12.6630
Total	**9.9000e-003**	**0.1395**	**0.0803**	**5.9000e-004**	**0.0285**	**1.2900e-003**	**0.0298**	**7.6800e-003**	**1.2300e-003**	**8.9200e-003**	**0.0000**	**58.6850**	**58.6850**	**3.5500e-003**	**7.8500e-003**	**61.1121**

3.3 Harvest - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.7600e-003	0.1342	0.0256	4.5000e-004	0.0126	1.2100e-003	0.0138	3.4500e-003	1.1500e-003	4.6100e-003	0.0000	46.1710	46.1710	3.0300e-003	7.3900e-003	48.4491
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.1400e-003	5.3700e-003	0.0547	1.4000e-004	0.0159	8.0000e-005	0.0160	4.2300e-003	8.0000e-005	4.3100e-003	0.0000	12.5141	12.5141	5.2000e-004	4.6000e-004	12.6630
Total	**9.9000e-003**	**0.1395**	**0.0803**	**5.9000e-004**	**0.0285**	**1.2900e-003**	**0.0298**	**7.6800e-003**	**1.2300e-003**	**8.9200e-003**	**0.0000**	**58.6850**	**58.6850**	**3.5500e-004**	**7.8500e-003**	**61.1121**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Manufacturing	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Manufacturing	6.60	5.50	6.40	59.00	28.00	13.00	92	5	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Manufacturing	0.487868	0.051904	0.208483	0.155237	0.030766	0.007315	0.011402	0.006111	0.000989	0.000607	0.031259	0.003553	0.004508

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Manufacturing	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Manufacturing	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Manufacturing	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Manufacturing	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	5.0700e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Unmitigated	5.0700e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.1600e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.9100e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Total	**5.0700e-003**	**0.0000**	**1.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.1600e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.9100e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Total	**5.0700e-003**	**0.0000**	**1.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Manufacturing	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Manufacturing	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Manufacturing	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Manufacturing	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Attachment B – Resume for Adam Poll

Adam Poll, LEED AP BD+C

Environmental Specialist

Adam Poll is an environmental specialist with 15 years' experience, trained in organizational greenhouse gas (GHG) accounting, which provided a thorough understanding of the Western Research Institute (WRI)/World Business Council for Sustainable Development (WBCSD) GHG Protocol Corporate Standard, while referring to the ISO 14064: Part 1 international standard for GHG inventories. Mr. Poll is experienced in GHG accounting principles, defining applications for GHG inventories, designing and development of GHG inventories, establishing GHG boundaries for an organization, identifying emission sources, tracking emissions over time, recalculations, establishing a base year, setting GHG reduction targets, inventory quality management, preparing a GHG inventory report, and preparing for verification.

Adam Poll

University of Denver

MS, Environmental Policy and Management, Energy and Sustainability, 2011

University of California, Santa Barbara

BS, Environmental Studies, 2006

Certifications

LEED AP BD+C, No. 10364581
International Organization for Standardization (ISO), No. 14001, Lead Auditor

Qualified Environmental Professional (QEP), No. 03120007

Professional Affiliations

Air & Waste Management Association

Relevant Previous Experience

GHG Inventory, Bexar County, Texas. Conducted county-wide GHG inventory. This provided the county with a baseline emissions inventory, emissions reductions strategies with projected reductions, and a GHG management plan outlining the steps necessary to implement the reductions. Acted as the technical lead for using Clean Action and Climate Protection (CACP) software, which was used to generate the emissions inventory and emissions reductions roadmap.

California Electronic GHG Reporting Tool (Cal e-GGRT) Submittal, SME, Santa Maria, California. Completed the online submittal of the calendar year 2013 emission inventory through the Cal e-GGRT reporting tool.

Air Emission Inventory (AEI) for Peterson AFB, Colorado. Conducted a stationary and mobile criteria air pollutant and GHG AEI for Peterson AFB. The inventory helped the base comply with Colorado Department of Public Health and Environment Title V recordkeeping and reporting requirements, in addition to the Air Force Instruction (AFI) 32-7040 requirements. The AEI was completed in the Air Force APIMS.

AEI for Minot AFB, North Dakota. Conducted a stationary and mobile criteria air pollutant and GHG AEI for Minot AFB. The inventory helped the base comply with North Dakota Department of Health Title V recordkeeping and reporting requirements, in addition to the AFI 32-7040 requirements. The AEI was completed in the Air Force APIMS.

AEI for Davis-Monthan AFB, Arizona. Conducted a stationary and mobile criteria air pollutant and GHG AEI for Davis-Monthan AFB. The inventory helped the base comply with Pima County Title V recordkeeping and reporting requirements, in addition to the AFI 32-7040 requirements. The AEI was completed in the Air Force APIMS.

AEI for Beale AFB, California. Conducted a stationary and mobile criteria air pollutant and GHG AEI for Beale AFB. The inventory helped the base comply with Feather River Air Quality Management District Title V recordkeeping and reporting requirements, in addition to the AFI 32-7040 requirements. The AEI was completed in the Air Force APIMS.

AEI for Laughlin AFB, Texas. The objective of the criteria air pollutant and GHG AEI was to meet the requirements in AFI 32-7040, Air Quality Compliance, which requires Air Force installations to conduct periodic source emission inventories. The AEI also supported the requirements of Executive Order (EO) 13514, which requires the reduction of GHGs. The AEI also fulfilled the base's regulatory obligation under the Texas Council on Environmental Quality (TCEQ) to provide both annual and ozone season emissions. The AEI was completed in the Air Force APIMS.

AEI for Join Base San Antonio (JBSA), Randolph, Texas. The objective of the criteria air pollutant and GHG AEI was to meet the requirements in AFI 32-7040, Air Quality Compliance, which requires Air Force installations to conduct periodic source emission inventories. The AEI also supported the requirements of EO 13514, which requires the reduction of GHGs. The AEI also fulfilled the base's regulatory obligation under the TCEQ to provide both annual and ozone season emissions. The AEI was completed in APIMS.

GHG and AEI for JBSA-Lackland, Texas. The objective of the criteria air pollutant and GHG AEI was to meet the requirements in AFI 32-7040, Air Quality Compliance, which requires Air Force installations to conduct periodic source emission inventories. The AEI also supported the requirements of EO 13514, which requires the reduction of GHGs. The AEI also fulfilled the base's regulatory obligation under the TCEQ to provide both annual and ozone season emissions. Lackland AFB is considered a major Title V source due to its Total Energy Plant. The GHG inventory was completed to upload to the Environmental Protection Agency (EPA) e-GRRT reporting tool for GHG emissions. The AEI was completed in APIMS.

Air Emission Inventory, Malmstrom AFB, Montana. The objective of the criteria air pollutant and GHG AEI was to meet the requirements in AFI 32-7040, Air Quality Compliance, which requires Air Force installations to conduct periodic source emission inventories. The Air Emission Inventory also supported the requirements of EO 13514, which requires the reduction of GHGs.

GHG Inventory Verification, Los Angeles AFB, California. Provided technical assistance in the verification of GHG emissions for the 2006 calendar year. The inventory was contrasted to the GHG Protocol and ISO 9001.

Landfill GHG Emissions Modeling, Edwards AFB, California. To ensure that the landfill located on Edwards AFB complied with AB 32, the GHG emissions were modeled using the EPA's Waste Reduction Model (WARM) in addition to other tools. This helped provide the necessary data to establish a landfill gas capture and destruction system.

EPA Climate Leaders Consultation, Union Bank, California. Provided GHG data management and verification services for Union Bank with regards to participating in the EPA Climate Leaders program. The work consisted of establishing an Inventory Management Program for Union Bank in addition to aligning the internal GHG management software with the Climate Leader program. Provided guidance for GHG baseline establishment and creating the Climate Leader goal.

Publications

Poll, Adam. 2011. "The Identification of Best Management Practices in a Materials Recovery Facility to Increase Solid Waste Diversion in the Department of Defense (DoD) Installations along the Front Range of Colorado to Satisfy the DoD Solid Waste Diversion Goal of 40%." University of Denver, Capstone Project. February 2011.

Poll, A., Reed, J., and Grover, B. 2018. “Evaluation of Greenhouse Gas Emissions Offset Availability within San Diego County.” December. https://www.ci.oceanside.ca.us/civicax/filebank/blobdload.aspx?BlobID=49641.

Estimated concentrations of biogenic volatile organic compounds from an outdoor *Cannabis* farm

Final Report

Prepared for:
Canna Rios, LLC
3205 White Rock Lane
Santa Maria, CA 93454

Attention:
Mr. Brandon Gesicki
Patriot Management
Canna Rios, LLC Project
PO Box 3074
Orcutt, CA 93457
cannariosllc@gmail.com
831-206-6460

Prepared by:
Dr. William Vizuete
Chief Scientific Officer
Byers Emissions Analysis
will.v@byers-scientific.com

December 10, 2021

Table of Contents

List of Figures

List of Tables

Executive Summary

The purpose of this study was to determine whether it is feasible for eucalyptol emissions from cannabis from the proposed project (3205 White Rock Lane Santa Maria, CA 93454) to taint grapes on a neighboring property (Appellant, 2963 GRAND AVE, LOS OLIVOS, CA 93441) based on a regulatory air dispersion model. Additionally, concentrations of emitted species were predicted at a designated tasting room.

To run our models, we completed the following tasks over the last several months:

1) Creation of emission rates for the proposed cannabis farm relying on measurement-based emissions factors of eucalyptol from five (5) cannabis strains.
2) Prediction of gas-phase concentrations using the cannabis farm's emission rates simulated over three (3) years using local meteorology data.
3) Determination of deposition rates from predicted gas-phase concentrations to grape material and comparison with the assumed threshold values.

Our modeling was based on the size and location of the proposed project – 3205 White Rock Lane, Santa Maria, CA 93454 – and utilized local meteorological data from the Santa Maria (KSMX) airport with upper air data from the Oakland International (KOAK) airport.

We have relied on a peer-reviewed publication ("Capone") which identifies 1,8-cineole (eucalyptol) as potentially having a detrimental impact on grapes. The study determined amounts of eucalyptol per grape material and the amount found in the wine. We sought to determine if it is possible for eucalyptol emissions from cannabis from the Canna Rios, LLC project to reach a 1,9-cineole wine consumer rejection threshold value at the neighboring farm.

It should be noted that, to date, 1,8 cineole (eucalyptol) is the only monoterpene to be identified as potentially causing wine taint. No other monoterpenes (such as beta-myrcene, alpha-terpinene, and terpinolene) have been found in peer-reviewed studies to cause taint.

The below describes the results and major findings of the estimation of cannabis farm emissions, the prediction of downwind concentrations, and the deposition to grape material of 1,8-cineole. The modeled rates of deposition were compared with published threshold values.

- For the cannabis monoterpenes to reach threshold values (that potentially taint grapes), they would have to emit at the highest rate, at the average predicted gas-phase concentrations, for 234-2,339 days at the fenceline. In other words, it would take 234-2,339 continual days of cannabis strains that have eucalyptol (not all strains have eucalyptol) emitting at the highest rate, without real world losses (such as photochemistry), to result in grape absorption of this monoterpene at the consumer rejection threshold value of 39.7 ug/kg.

- Our modeling was very conservative and did not include real-world losses of gas-phase concentrations due to photochemistry and deposition during transport and thus are upper bound estimations. In reality, gas-phase concentrations of monoterpenes in the atmosphere have an average lifetime of minutes to hours in full sunlight, further reducing the possibility that the emission would travel to the nearby farm and taint the grapes.

Goals

The goal of this work was to determine the amount of deposition of gas-phase concentrations of 1,8-cineole that could occur on grape material, and then compare those concentrations with a consumer rejection threshold. This goal was achieved by accomplishing the following tasks:

1) Using measurement-based emission factors from leaf enclosures for five (5) different strains of cannabis to estimate emission rates for the proposed cannabis farm based on the anticipated canopy size
2) Predict gas-phase concentrations using EPA-approved dispersion modeling
3) Estimate time to achieve consumer rejection thresholds for 1,8-cineole onto grape material downwind

Details on the methodology used in these tasks and results are described below.

1: Emission rates for *Cannabis* Farm

Canna Rios, LLC reported 745,620 square feet of cannabis cultivation denoted in red on Figure 1. The client reported that the cultivation will be evenly distributed among five (5) strains: Member Berry, Forbidden Fruit, Gorilla Glue, Presidential OG and Wedding Cake. Assuming a biomass density of 1,500 g/m^2 for each strain, and using measured emission factors, emission rates of 1,8-cineole were determined from the proposed cannabis farm. It was determined that the farm would emit 3,332 g/hr of total biogenic volatile organic compounds of which 0.446 g/hr was 1,8-cineole. The client reported 2.9 acres of buffer landscaping which was included in this modeling as a reduction in emissions. Concentrations at point 1 in Figure 1 were used with deposition velocities described below to calculate a loss rate due to buffer landscaping. This was included in all modeling presented here.

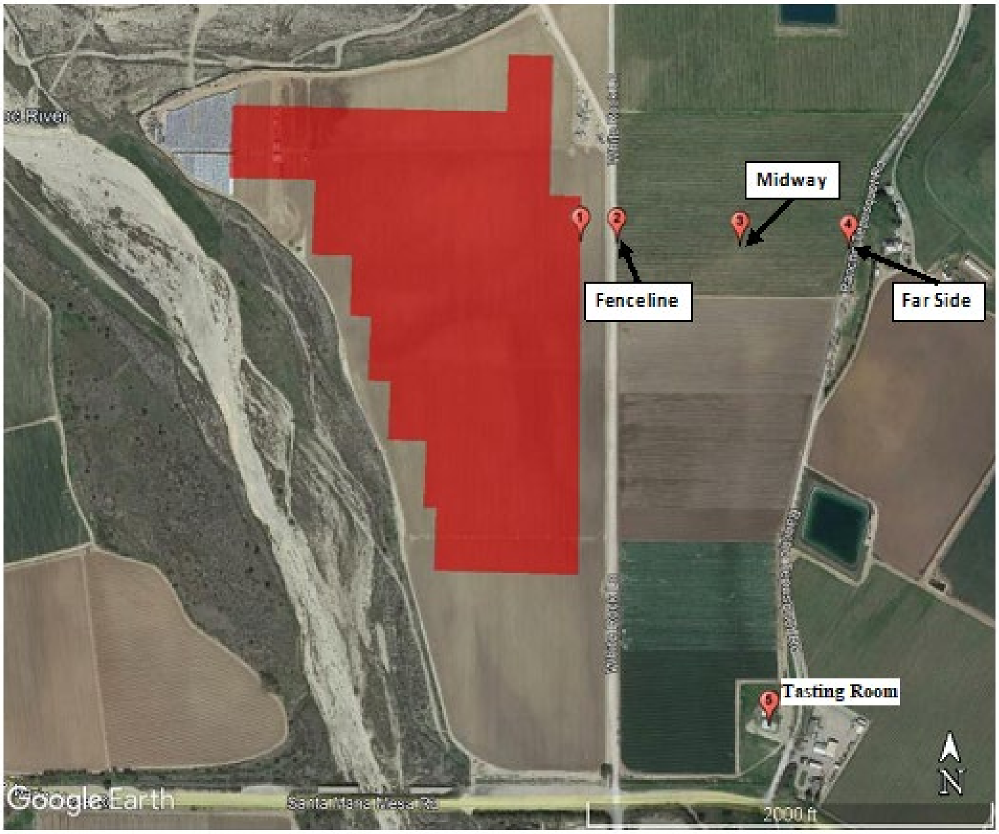


Figure 1. The location of the farm, modeled as an area source, shown as a red shade. Also shown are the four (4) receptor locations (fenceline, midway, far side and tasting room) where model predictions were made.

2. Modeling Systems for Predicted Gas-Phase Concentrations

2a: Dispersion Model

Air dispersion modeling was completed using AERMOD v21112 to determine the (one) 1-hour gas-phase concentration of 1,8-cineole. AERMOD is a U.S. EPA approved steady-state plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain [1].

It was assumed that 745,620 square feet of cannabis cultivation will be spread over roughly 47-48 acres as shown in red shade in Figure 1. All model predictions were completed for June – August from 2018-2020 using observed meteorological data derived from the Santa Maria (KSMX) airport monitoring station. July/August coincides with most mature plants and harvest indicating highest probability of emissions and ozone formation. Figure 1 provides the location of the farm at 3205 White Rock Lane, Santa Maria, CA 93454 that was modeled as an area source denoted in a red shade. The receptor locations where 1,8-cineole was predicted is at the fenceline, midway, far side, and tasting room as shown in Figure 1

3: Terpene Deposition Rates

Comparison with threshold values requires estimation of deposition rates of the gas-phase molecules into the grape tissue. Deposition from the gas-phase is an important process that must be addressed in all air-quality models. Wesely (1989) developed a parameterization scheme for estimating gaseous dry deposition velocities, which has been widely used in a number of models [2]. A review of available dry deposition models has been reported by Wesely and Hicks (2000) [3]. Most existing dry deposition models utilize the multiple resistance analogy approach when parameterizing the deposition velocity to vegetation and other surfaces.

This analysis relied on the deposition velocities estimated in the CMAQ modeling system described above. In the CMAQ modeling system 1,8-cineole is represented by the TERP species. At the location of the receptor, the daily averaged deposition velocity for TERP species is shown in Table 1 on July 3, 2016, by land use/land cover types. Since there is no deposition velocity for grape tissue a surrogate must be assumed. For this study two runs were completed, one with the Cultivated Crops value of 2.7e-2 cm/s, and a second run with using water's value of 1.7e-3 cm/s. Using these velocities, and predicted gas-phase concentrations, a flux of 1,8-cineole can be determined.

Table 1. Daily averaged deposition velocity (cm/s) for monoterpenes (TERP) predicted by the CMAQ model for July 2016 by Land Use/Land Cover type. Cultivated Crops (Bold) was used in this study.

Land Use/Land Cover	Deposition Velocity (cm/s)
Water	1.70E-03
Developed Open Space	1.91E-02
Developed Low Intensity	1.43E-02
Developed Medium Intensity	1.25E-02
Developed High Intensity	1.20E-02
Barren Land	1.15E-02
Evergreen Forest	3.37E-02
Mixed Forest	3.36E-02
Shrub/Scrub	1.33E-02
Grassland/Herbaceous	1.70E-02
Pasture/Hay	2.48E-02
Cultivated Crops	**2.70E-02**
Woody Wetlands	3.31E-02
Emergent Herbaceous Wetlands	1.98E-02
Overall	*2.10E-02*

4. Wine Consumer Rejection Threshold (1,8 Cineole)

There currently exists only one (1) peer-reviewed study that has linked the influence of 1,8-cineole (eucalyptol) in vineyards to taint in corresponding red wines [4]. Capone et al. examined the effects that eucalyptus trees had on nearby vineyard operations. The study found the largest concentrations of 1,8-cineole in grape samples closest to eucalyptus trees. The study results were used to determine a consumer rejection threshold value for 1,8-cineole against which modeled deposition rates from predicted gas-phase concentrations could be compared.

Data from Capone el al. is shown in Figure 2 showing 1,8-cineole concentrations in grape tissue from four (4) grapevine rows over three (3) vintages. Triplicate sampling was conducted at each of the three (3) positions within each row. Using the highest measured values closest to the eucalyptus trees, a three (3)-year average was calculated of 2.6 ug/kg of 1,8-cineole per grape material.

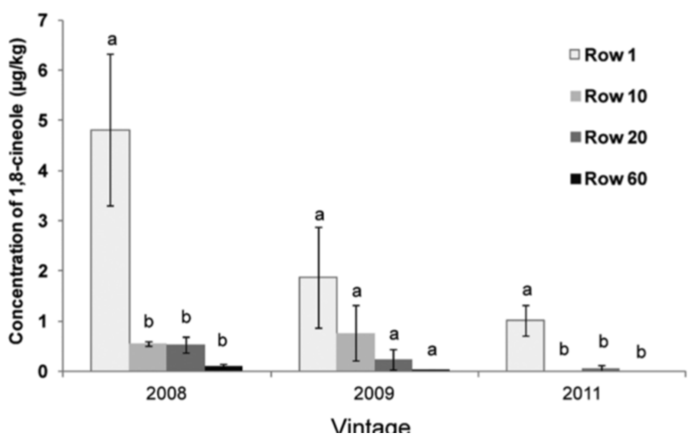


Figure 2. Concentration of 1,8-cineole (ug/kg) in grapes from different rows at set distances from the Eucalyptus trees over three (3) vintages. Error bars represent the standard error of the mean for three (3) replicates. Different letters indicate significant differences between the means ($p < 0.05$).

These same researchers also completed several experiments where they quantified the amount of 1,8-cineole from grape tissue that would remain through processing in the resulting wine. This experiment was labelled “control” and the results are shown in Figure 3 where grape tissue 1,8-cineole contributed to 1.8 ug/L in the wine.

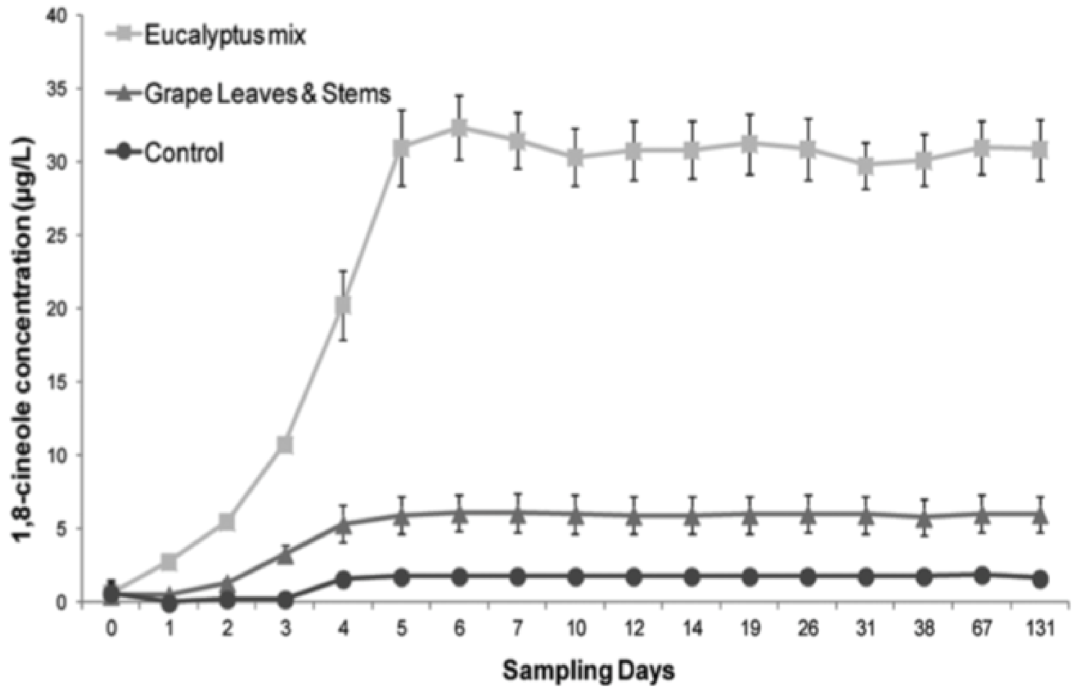


Figure 3. Mean concentrations of 1,8-cineole (µg/L) where error bars represent the 95% confidence interval. Day 0 = crushed and cold soaked, day 1 = inoculated with yeast, day 6 = pressed, day 8 = racked, day 12 = inoculated for MLF, day 38 = racked, day 67 = prior to bottling, and day 131 = 64 days postbottling.

Using the measured 1,8 cineole on grape skins and its contribution in wine, as shown in Table 2, a ratio was calculated that could then be scaled to meet a known consumer rejection threshold. Shown in Table 2 is a published wine consumer rejection threshold for 1,8 cineole of 27.5 ug/L [5]. Thus, a consumer rejection threshold for grape tissues can be calculated and is shown in Table 3 as 39.7 ug/kg. This value was used as the threshold value for 1,8-cineole in the present modeling analysis.

Table 2. Measured amounts of 1,8-cineole in wind and grape skins and the published consumer rejection threshold for wine.

Grape skin contribution in wine (ug/L)	1.80	*Capone et al., 2012*
Measured on grape skin (ug/kg)	2.60	*Capone et al., 2012*
Consumer rejection threshold (ug/L)	27.5	*Saliba et al., 2009*
On Grape Skin Rejection Threshold (ug/kg)	39.7	

5. Impacts on Grapes

Using AERMOD, and three years of summer meteorological data, we produced 6,570 hours of predictions of 1,8-cineole concentrations at the receptors shown in Figure 1. Using the 6,570 hours of predictions an average concentration was calculated to represent the most common conditions and is shown in Table 1. Using this average concentration, the time to reach the consumer rejection threshold value was then calculated using the deposition velocities described above. Given the unknown deposition rate of 1,8-cineole to grape tissue tow simulations were completed with either a deposition velocity of 2.7e-2 cm/s (Upper) or 1.7e-3 cm/s (Lower). Assuming a yield of three (3) tons of grapes per acre [6] the rate of 1,8-cineole per mass of grape tissue was calculated. These results were then used to determine how long it would take to reach the consumer rejection threshold values and results are shown in Table 2. As shown in Table 3 to reach threshold values at the fenceline would require, at the predicted average gas-phase concentrations, 234-2,339 days.

It should be noted that although monoterpenes, once released, are highly reactive to sunlight and other environmental factors, the modeling did not account for photochemical or other types of degradation and loss that can often occur during transport. In addition, the modeling assumed a smaller plume rise than one would normally expect from a cannabis farm of this size, and for these reasons the modeling results should be considered very conservative.

Table 3. The model predicted average gas-phase concentrations and the number of days to achieve the eucalyptol threshold value. Note, the concentration values are depicted in scientific notation (Far Side is a smaller concentration by an order of magnitude than the Midway and Fenceline).

	Time to reach Threshold* (Days)		**Average Eucalyptol Concentration (ug/m3)**
Deposition Velocity	*Upper*	*Lower*	
Fenceline	234	2,339	4.90E-03
Midway	674	6,743	1.70E-03
Far Side	1,274	12,736	9.00E-04

*Eucalyptol Consumer Rejection Threshhold Value 39.7 ug/kg

6. Tasting Room Concentrations

Using AERMOD, and three years of summer meteorological data, we produced 6,570 hours of predictions of total biogenic volatile organic compounds (BVOC) and 1,8-cineole concentrations at tasting room location shown in Figure 1. Using the 6,570 hours of predictions an average concentration was calculated to represent the most common conditions and is shown in Table 4.

Table 4. The model predicted average gas-phase concentrations at tasting room location.

	Average Concentration (ug/m3)	Average Concentration (ppt)
Eucalytpol	1.20E-04	0.21
Total BVOC*	0.90	1568

*Biogenic Volatile Organic Carbon

Reference:

1. EPA. *AERMOD Modeling System*. 2019; Available from: https://www.epa.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models#aermod.
2. Wesely, M.L., *Parameterization of Surface Resistances to Gaseous Dry Deposition in Regional-Scale Numerical-Models.* Atmospheric Environment, 1989. **23**(6): p. 1293-1304.
3. Wesely, M.L. and B.B. Hicks, *A review of the current status of knowledge on dry deposition.* Atmospheric Environment, 2000. **34**(12-14): p. 2261-2282.
4. Capone, D.L., D.W. Jeffery, and M.A. Sefton, *Vineyard and Fermentation Studies To Elucidate the Origin of 1,8-Cineole in Australian Red Wine.* Journal of Agricultural and Food Chemistry, 2012. **60**(9): p. 2281-2287.
5. Saliba, A.J., J. Bullock, and W.J. Hardie, *Consumer rejection threshold for 1, 8-cineole (eucalyptol) in Australian red wine.* Food Quality and Preference, 2009. **20**(7): p. 500-504.
6. EViticulture. *How many grapes can I produce per acre?* 2019; Available from: https://grapes.extension.org/how-many-grapes-can-i-produce-per-acre-how-much-yield-can-i-expect-when-they-are-in-full-production/.

William Vizuete

Address: 2332 W. Industrial Park Drive, Bloomington, IN 47404
Email:will.v@byers-scientific.com

EDUCATION

Ph.D. in Chemical Engineering, University of Texas - Austin, TX 2005
M.S. in Chemical Engineering, University of Texas - Austin, TX 2003
B.S. Cum Laude in Chemical Engineering, University of Missouri - Rolla, MO 1998

PROFESSIONAL EXPERIENCE

Associate Professor 2012-present
Dept. of Environmental Sciences & Engineering
University of North Carolina - Chapel Hill

Founder, Chief Scientific Officer 2019-present
Byers Scientific

Division Head of Tech. & Entrepreneurship 2018-present
UNC Institute for Environmental Health Solutions

Director 2017-present
UNC MSEE Program

Founder, Chief Scientific Officer 2011-2017
Biodeptronix, LLC

Assistant Professor 2005-2012
Dept. of Environmental Sciences & Engineering
University of North Carolina - Chapel Hill

Process Engineer 1998-2000
ExxonMobil, Baton Rouge, LA

HONORS, AWARDS AND RECOGNITIONS

- Teaching Excellence and Innovation Award UNC-Chapel Hill 2020
- RTI International University Scholar 2019
- National Center of Atmospheric Research Visiting Professor Faculty Fellowship Program 2016
- National Science Foundation Innovation Corps Teams Program for Faculty Entrepreneurship 2013
- NC Translational and Clinical Sciences Institute Kickstart Award for Faculty Entrepreneurship 2012
- National Center of Atmospheric Research Visiting Professor Faculty Fellowship Program 2007
- Thrust - Uniden Endowed Graduate Fellowship in Engineering 2002–2005
- National Consortiums for Graduate Degrees for Minorities in Engineering and Science Fellowship 2000–2002

PUBLICATIONS

Books and Chapters

1. Rao V., **Vizuete, W.**, "Particulates Matter" First Edition, Paperback ISBN: 9780128169049, eBook ISBN: 9780128169056, Elsevier, USA (2020)
2. Vennam, L., Arunachalam, S., Baek B.H., Omary M., Binkowski F.S., Olsen S., Mathur R., **Vizuete, W.**, Fleming G., "A Multiscale Modeling Study to Assess Impacts of Full-Flight Aircraft Emissions on Upper Troposphere and Surface Air Quality" in D.G. Steyn and R. Mathur (editors), "Air Pollution Modeling and its Application XXIII", ISBN: 978-3-319-04378-4 (Print) 978-3-319-04379-1 (Online), Springer, The Netherlands (2014)
3. Li Y., Puggioni G., Jat P. Hasan M., Serre M., Sexton K., West J.J., Arunachalam S., Shankar U., **Vizuete, W.**, Farooqui Z., "Burden of Disease from Outdoor Air Pollution" in Gibson J.M., Brammer A., Davidson C., Folley T., Launay F., Thomasen J., (editors), "Environmental Burden of Disease Assessment" Springer, New York, pp. 73-108 (2013)
4. Li Y., Puggioni G., Jat P. Hasan M., Davidson C., Serre M., Sexton K., West J.J., Arunachalam S., Shankar U., **Vizuete, W.**, Farooqui Z., "Outdoor Air" in Macdonald-Gibson, J. (editor), "National Strategy and Action Plan for Environmental Health United Arab Emirates" Environment Agency Abu Dhabi, United Arab Emirates (2010)

Peer Reviewed Publications (Total=76)

C = Dr. Vizuete as corresponding author
* = student supervised by Dr. Vizuete

1. Younan, D., Wang, X., Casanova, R., Barnard, R., Gaussoin, S.A., Saldana, S., Petkus, A.J., Beavers, D.P., Resnick, S.M., Manson, J.E., Serre, M.L., **Vizuete, W.,** Henderson, V.W., Sachs, B.C., Salinas, J., Gatz, M., Espeland, M.A., Chui, H.C., Shumaker, S.A., Rapp, S.R., Chen, J.C. (2021) "$PM_{2.5}$ Associated with Gray Matter Atrophy Reflecting Increased Alzheimer Risk in Older Women." Neurology, **96**(8): e1190-e1201. https://doi.org/10.1212/WNL.0000000000011149
2. Younan, D., Wang, X., Petkus, A., Gruenewald, T., Casanova, R., Serre, M., **Vizuete, W**., Beavers, D., Braskie, M., He, K. (2020) "Increased neuroanatomic risk for Alzheimer's disease at preclinical stage: Exploring the interaction of fine particle exposure and psychosocial stress: Epidemiology: Effects of air pollution on cognition." Alzheimer's & Dementia **16**: e046623. https://doi.org/10.1002/alz.046623
3. Eaves, L., Nguyen, H.T.*, Rager, J. E., Sexton, K. G., Howard, T., Smeester, L., Freedman, A. N., Aagaard, K. M., Shope, C., Lefer, B. Flynn, J. H., Erickson, M. H.Fry, R. C., **Vizuete, W.**[C] (2020) "Identifying the Transcriptional Response of Cancer and Inflammation-Related Genes in Lung Cells in Relation to Ambient Air Chemical Mixtures in Houston, Texas." Environmental Science & Technology **54**(21): 13807-13816. https://doi.org/10.1021/acs.est.0c02250
4. Schmedding, R.*, Rasool, Q.Z.*, Zhang, Y., Pye, H.O.T., Zhang, H., Chen, Y., Surratt, J.D., Lopez-Hilfiker, F.D., Thornton, J.A., Goldstein, A.H. and **Vizuete, W.**[C] (2020) "Predicting secondary organic aerosol phase state and viscosity and its effect on multiphase chemistry in a regional-scale air quality model." Atmospheric Chemistry and Physics **20**(13): 8201-8225.
5. Wang C.-T*, Ashworth K., Wiedinmyer C., Ortega J., Harley P.C., Rasool Q.Z., and **Vizuete, W.**[C] (2020) "Ambient measurements of monoterpenes near Cannabis cultivation facilities in Denver, Colorado." Atmospheric Environment **232**: 117510.
6. Chen C., Xun P., Kaufman J.D., Hayden K.M., Espeland M.A., Whitsel E.A., Serre M.L., **Vizuete, W.**, Orchard T., Harris W., Wang X., Chui H.C., Chen J.C., and Ka He. (2020) "Erythrocyte Omega-3 Index,

Ambient Fine Particle Exposure and Brain Aging." Neurology **95**(8): e995-e1007. https://doi.org/10.1212/WNL.0000000000010074

7. Younan D., Petkus A. J., Widaman K. F., Wang X., Casanova R., Espeland M. A., Gatz M., Henderson V. W., Manson J. E., Rapp S. R., Sachs B. C., Serre M. L., Gaussoin S. A., Barnard R., Saldana S., **Vizuete, W.**, Beavers D. P., Salinas J. A., Chui H. C., Resnick S. M., Shumaker S. A., and J.C. Chen (2020) "Particulate matter and episodic memory decline mediated by early neuroanatomic biomarkers of Alzheimer's disease." Brain **143**(1): 289-302. https://doi.org/10.1093/brain/awz348
8. Petkus A. J., Younan D., Widaman K., Gatz M., Manson J. E., Wang X., Serre M., **Vizuete, W.**, Chui H., Espeland M. A., Resnick S., and J.C. Chen (2020). "Exposure to fine particulate matter and temporal dynamics of episodic memory and depressive symptoms in older women" Environment International **135**: 105196. https://doi.org/10.1016/j.envint.2019.105196
9. Chen, Y., Zhang, Y., Lambe, A.T., Xu, R., Lei, Z., Olson, N.E., Zhang, Z., Szalkowski, T.*, Cui, T., **Vizuete, W.** and Gold, A. (2020) "Heterogeneous Hydroxyl Radical Oxidation of Isoprene Epoxydiol-Derived Methyltetrol Sulfates: Plausible Formation Mechanisms of Previously Unexplained Organosulfates in Ambient Fine Aerosols." Environmental Science & Technology Letters **7**(7): 460-468. https://doi.org/10.1021/acs.estlett.0c00276
10. Pfister, G., Wang, C.-T.*, M. Barth, F. Flocke, **Vizuete, W.**, S. Walters (2019). "Chemical Characteristics and Ozone Production in the Northern Colorado Front Range" Journal of Geophysical Research – Atmospheres **124**(23): 13397-13419. https://doi.org/10.1029/2019JD030544
11. Shankar, U.*, D. McKenzie, J.P. Prestemon, B.H. Baek, M. Omary, D. Yang, A. Xiu, K. Talgo, and **Vizuete, W.**[C] (2019). "Evaluating wildfire emissions projection methods in comparisons of simulated and observed air quality." Atmospheric Chemistry & Physics **19**: 15157–15181, https://doi.org/10.5194/acp-19-15157-2019
12. Wang, C.-T.*, C. Wiedinmyer, K. Ashworth, P. C. Harley, J. Ortega and **Vizuete, W.**[C] (2019). "Leaf enclosure measurements for determining volatile organic compound emission capacity from Cannabis spp." Atmospheric Environment **199**: 80-87.
13. Wang, C.-T.*, C. Wiedinmyer, K. Ashworth, P. Harley, J. Ortega, Q. Z. Rasool and **Vizuete, W.**[C] (2019). "Potential Regional Air Quality Impacts of Cannabis Cultivation Facilities in Denver, Colorado." Atmospheric Chemistry & Physics **19**: 13973–13987, https://doi.org/10.5194/acp-19-13973-2019
14. Schmedding, R.*, M. Ma, Y. Zhang, S. Farrell*, H. O. T. Pye, Y. Chen, C.-T. Wang*, Q. Z. Rasool, S. H. Budisulistiorini, A. P. Ault, J. D. Surratt and **Vizuete, W.**[C] (2019). "α-Pinene-Derived organic coatings on acidic sulfate aerosol impacts secondary organic aerosol formation from isoprene in a box model." Atmospheric Environment **213**: 456-462.
15. Riva, M., Y. Chen, Y. Zhang, Z. Lei, N. Olson, H. C. Boyer, S. Narayan, L. D. Yee, H. Green, T. Cui, Z. Zhang, K. D. Baumann, M. Fort, E. S. Edgerton, S. Budisulistiorini, C. A. Rose, I. Ribeiro, R. L. e Oliveira, E. Santos, S. Szopa, C. Machado, Y. Zhao, E. Alves, S. de Sa, W. Hu, E. Knipping, S. Shaw, S. Duvoisin Junior, R. A. F. d. Souza, B. B. Palm, J. L. Jimenez, M. Glasius, A. H. Goldstein, H. O. T. Pye, A. Gold, B. J. Turpin, **Vizuete, W.**, S. T. Martin, J. Thornton, C. S. Dutcher, A. P. Ault and J. D. Surratt (2019). "Increasing Isoprene Epoxydiol-to-Inorganic Sulfate Aerosol (IEPOX:Sulfinorg) Ratio Results in Extensive Conversion of Inorganic Sulfate to Organosulfur Forms: Implications for Aerosol Physicochemical Properties." Environmental Science & Technology **53**(15): 8682-8694. https://doi.org/10.1021/acs.est.9b01019.
16. Petkus, A. J., D. Younan, X. Wang, M. Serre, **Vizuete, W.**, S. Resnick, M. A. Espeland, M. Gatz, H. Chui and J. E. Manson (2019). "Particulate air pollutants and trajectories of depressive symptoms in older women." The American Journal of Geriatric Psychiatry **27**(10): 1083-1096.
17. Zhang, Y., Y. Chen, A. T. Lambe, N. E. Olson, Z. Lei, R. L. Craig, Z. Zhang, A. Gold, T. B. Onasch, J. T. Jayne, D. R. Worsnop, C. J. Gaston, J. A. Thornton, **Vizuete, W.**, A. P. Ault and J. D. Surratt (2018). "Effect of the Aerosol-Phase State on Secondary Organic Aerosol Formation from the Reactive Uptake of Isoprene-Derived Epoxydiols (IEPOX)." Environmental Science & Technology Letters **5**(3): 167-174. *Awarded ES&T's Top 5 best papers of the year.*
18. Younan, D., X. Wang, A. J. Petkus, R. Casanova, R. Barnard, S. A. Gaussoin, S. Saldana, S. M. Resnick, M. Serre and **Vizuete, W.** (2018). "Environmental Determinants of Neuroanatomic Risk for Alzheimer's Disease

in Older Women: Role of Fine Particulate Matter." Alzheimer's & Dementia: The Journal of the Alzheimer's Association **14**(7): P278.

19. Younan, D., X. Wang, F. Lurmann, M. Serre, **Vizuete, W.**, K. He, M. N. Braskie, M. Gatz, H. C. Chui and M. A. Espeland (2018). "Racial-Ethnic Disparities in Alzheimer's Risk: Role of Exposure to Ambient Fine Particles." Alzheimer's & Dementia: The Journal of the Alzheimer's Association **14**(7): P1613.
20. Shankar, U.*, J. P. Prestemon, D. McKenzie, K. Talgo, A. Xiu, M. Omary, B. H. Baek, D. Yang and **Vizuete, W.** (2018). "Projecting Wildfire Emissions Over the South-eastern United States to Mid-century." International Journal of Wildland Fire **27**(5): 313-328.
21. Xu, Y.*, M. L. Serre, J. M. Reyes and **Vizuete, W.**[C] (2017). "Impact of Temporal Upscaling and Chemical Transport Model Horizontal Resolution on Reducing Ozone Exposure Misclassification." Atmospheric Environment **166**: 374-382.
22. Vennam, L. P.*, **Vizuete, W.**, K. Talgo, M. Omary, F. S. Binkowski, J. Xing, R. Mathur and S. Arunachalam (2017). "Modeled Full-Flight Aircraft Emissions Impacts on Air Quality and Their Sensitivity to Grid Resolution." Journal of Geophysical Research: Atmospheres **122**(24): 13,472-413,494.
23. Reyes, J., Y. Xu*, **Vizuete, W.** and M. Serre (2017). "Regionalized $PM_{2.5}$ Community Multiscale Air Quality Model Performance Evaluation across a Continuous Spatiotemporal Domain." Environmental Science & Technology **148**: 258–265.
24. Lin, Y.-H., M. Arashiro, P. W. Clapp, T. Cui, K. G. Sexton, **Vizuete, W.**, A. Gold, I. Jaspers, R. C. Fry and J. D. Surratt (2017). "Gene Expression Profiling in Human Lung Cells Exposed to Isoprene-Derived Secondary Organic Aerosol." Environmental science & technology **51**(14): 8166-8175.
25. Chen, J., X. Wang, R. Casanova, M. Serre, **Vizuete, W.**, H. Chui, S. Resnick and M. Espeland (2017). "Neurotoxic Effects of Ambient Air Pollution on Brain Structure and Dementia Risk in Older Women." Innovation in Aging **1**(Suppl 1): 632.
26. Chang, S. Y.*, **Vizuete, W.**[C], M. Serre, L. P. Vennam, M. Omary, V. Isakov, M. Breen and S. Arunachalam (2017). "Finely Resolved On-Road $PM_{2.5}$ and Estimated Premature Mortality in Central North Carolina." Risk Analysis **37**(12): 2420-2434.
27. Cacciottolo, M., X. Wang, I. Driscoll, N. Woodward, A. Saffari, R. J., M. Serre, **Vizuete, W.**, C. Sioutas, T. Morgan, M. Gatz, H. C. Chui, S. S.A., S. M. Resnick, M. A. Espeland, F. C.E. and J. C. Chen (2017). "Particulate Air Pollutants, APOE Alleles, and Their Contributions to Cognitive Impairment in Older Women and to Amyloidogenesis in Experimental Models." Translational Psychiatry **7**(1): 8.
28. Ashworth, K. and **Vizuete, W.**[C] (2017). "High Time to Assess the Environmental Impacts of Cannabis Cultivation." Environmental Science & Technology **51**(5): 2531-2533.
29. Zavala, J.*, O'brien, K. Lichtveld, K. Sexton, I. Rusyn, I. Jaspers and **Vizuete, W.**[C] (2016). "Assessment of Biological Responses of EpiAirwayTM 3-D Cell Constructs vs. A549 Cells for Determining Toxicity of Ambient Air Pollution." Inhalation Toxicology **28**(6): 251-259.
30. Xu, Y. *, M. L. Serre, J. Reyes and **Vizuete, W.**[C] (2016). "Bayesian Maximum Entropy Integration of Ozone Observations and Model Predictions: A National Application." Environ Sci Technol **50**(8): 4393-4400.
31. Riedel, T. P., Z. Zhang, K. chu, J. Thornton, **Vizuete, W.**, A. Gold and J. D. Surratt (2016). "Constraining Condensed-Phase Formation Kinetics of Secondary Organic Aerosol Components from Isoprene Epoxydiols." Atmospheric Chemistry and Physics **16**(3): 1245-1254.
32. Couzo, E.*, J. McCann, **Vizuete, W.**, S. Blumsack and J. J. West (2016). "Modeled Response of Ozone to Electricity Generation Emissions in the Northeastern United States Using Three Sensitivity Techniques." Journal of the Air & Waste Management Association **66**(5): 456-469.
33. Casanova, R., X. Wang, J. Reyes, Y. Akita, M. L. Serre, **Vizuete, W.**, H. C. Chui, I. Driscoll, S. M. Resnick, M. A. Espeland, J. C. Chen, A. D'Abreu and G. Spalletta (2016). "A Voxel-Based Morphometry Study Reveals Local Brain Structural Alterations Associated with Ambient Fine Particles in Older Women." Front Hum Neurosci **10**: 495.
34. Arashiro, M., Y.-H. Lin, K. Sexton, Z. Zhang, I. Jaspers, R. Fry, **Vizuete, W.**, A. Gold and J. Surratt (2016). "*In Vitro* Exposures to Isoprene-Derived Secondary Organic Aerosol: Assessing the Effects on Inflammation-Associated Gene Expression in Human Bronchial Epithelial Cells using a Direct Deposition Approach." Atmospheric Chemistry and Physics **16**: 14079-14090.

35. **Vizuete, W.**[C], K. G. Sexton, H. Nguyen, L. Smeester, K. M. Aagaard, C. Shope, B. Lefer, J. H. Flynn, S. Alvarez, M. H. Erickson and R. C. Fry (2015). "From the Field to the Laboratory: Air Pollutant-Induced Genomic Effects in Lung Cells." Environ Health Insights **9**(Suppl 4): 15-23.
36. Vennam, L. P.*, **Vizuete, W.** and S. Arunachalam (2015). "Evaluation of Model-Predicted Hazardous Air Pollutants (Haps) Near a Mid-Sized US Airport." Atmospheric Environment **119**: 107-117.
37. Seltzer, K. M., **Vizuete, W.** and B. H. Henderson* (2015). "Evaluation of Updated Nitric Acid Chemistry on Ozone Precursors and Radiative Effects." Atmospheric Chemistry and Physics **15**(10): 5973-5986.
38. Riedel, T. P., Y. H. Lin, H. Budisulistiorini, C. J. Gaston, J. A. Thornton, Z. F. Zhang, **Vizuete, W.**, A. Gold and J. D. Surratt (2015). "Heterogeneous Reactions of Isoprene-Derived Epoxides: Reaction Probabilities and Molar Secondary Organic Aerosol Yield Estimates." Environmental Science & Technology Letters **2**(2): 38-42.
39. Karamchandani, P., C. Emery, G. Yarwood, B. Lefer, J. Stutz, E. Couzo and **Vizuete, W.** (2015). "Implementation and Refinement of a Surface Model for Heterogeneous HONO Formation in a 3-D Chemical Transport Model." Atmospheric Environment **112**: 356-368.
40. Couzo, E.*, B. Lefer, J. Stutz, G. Yarwood, P. Karamchandani, B. Henderson and **Vizuete, W.**[C] (2015). "Impacts of Heterogeneous HONO Formation on Radical Sources and Ozone Chemistry in Houston, Texas." Atmospheric Environment **112**: 344-355.
41. Chen, Y. Z.*, K. G. Sexton, R. E. Jerry, J. D. Surratt and **Vizuete, W.**[C] (2015). "Assessment of SAPRC07 with Updated Isoprene Chemistry against Outdoor Chamber Experiments." Atmospheric Environment **105**: 109-120.
42. Chang, S. Y.*, **Vizuete, W.**[C], A. Valencia, B. Naess, V. Isakov, T. Palma, M. Breen and S. Arunachalam (2015). "A Modeling Framework for Characterizing Near-Road Air Pollutant Concentration at Community Scales." Sci Total Environ **538**: 905-921.
43. Chang, S. Y.*, **Vizuete, W.**[C], M. Breen, V. Isakov and S. Arunachalam (2015). "Comparison of Highly Resolved Model-Based Exposure Metrics for Traffic-Related Air Pollutants to Support Environmental Health Studies." Int J Environ Res Public Health **12**(12): 15605-15625.
44. Casanova, R., X. Wang, J. Reyes, Y. Akita, M. Serre, **Vizuete, W.**, H. C. Chui, I. Driscol, S. M. Resnick and M. A. Espeland (2015). "Exposures to Fine Particulate Air Pollutants are Associated with Smaller Brain Volumes in Older Women: A Voxel-Based Analysis." Alzheimer's & Dementia: The Journal of the Alzheimer's Association **11**(7): P148-P149.
45. Zavala, J.*, K. Lichtveld, S. Ebersviller, J. L. Carson, G. Walters, I. Jaspers, H. Jeffries, K. Sexton and **Vizuete, W.**[C] (2014). "The Gillings Sampler A Portable Electrostatic Air Sampler as an Alternative Method for Aerosol *In Vitro* Exposure Studies." Chemico-Biological Interactions **220**: 158-168.
46. Lin, Y.-H., K. G. Sexton, I. Jaspers, Y.-R. Li, J. D. Surratt and **Vizuete, W.**[C] (2014). "Application of Chemical Vapor Generation Systems to Deliver Constant Gas Concentrations for *In Vitro* Exposure to Volatile Organic Compounds." Environmental Science: Processes & Impacts **16**(12): 2703-2710.
47. Haman, C. L., E. Couzo*, J. H. Flynn, **Vizuete, W.**, B. Heffron and B. L. Lefer (2014). "Relationship Between Boundary Layer Heights and Growth Rates with Ground-Level Ozone in Houston, Texas." Journal of Geophysical Research-Atmospheres **119**(10): 6230-6245.
48. Weir, C. H.*, K. B. Yeatts, J. A. Sarnat, **Vizuete, W.**, P. M. Salo, R. Jaramillo, R. D. Cohn, H. Chu, D. C. Zeldin and S. J. London (2013). "Nitrogen Dioxide and Allergic Sensitization in the 2005–2006 National Health and Nutrition Examination Survey." Respiratory medicine **107**(11): 1763-1772.
49. Parikh, H. M.*, H. E. Jeffries, K. G. Sexton, D. J. Luecken, R. M. Kamens and **Vizuete, W.**[C] (2013). "Evaluation of Aromatic Oxidation Reactions in Seven Chemical Mechanisms with an Outdoor Chamber." Environmental Chemistry **10**(3): 245-259.
50. Lin, Y. H., H. F. Zhang, H. O. T. Pye, Z. F. Zhang, W. J. Marth, S. Park, M. Arashiro, T. Q. Cui, H. Budisulistiorini, K. G. Sexton, **Vizuete, W.**, Y. Xie, D. J. Luecken, I. R. Piletic, E. O. Edney, L. J. Bartolotti, A. Gold and J. D. Surratt (2013). "Epoxide as a Precursor to Secondary Organic Aerosol Formation from Isoprene Photooxidation in the Presence of Nitrogen Oxides." Proceedings of the National Academy of Sciences of the United States of America **110**(17): 6718-6723.

51. Kolling, J. S. *, J. E. Pleim, H. E. Jeffries and **Vizuete, W.**[C] (2013). "A Multisensor Evaluation of the Asymmetric Convective Model, Version 2, In Southeast Texas." Journal of the Air & Waste Management Association **63**(1): 41-53.
52. Couzo, E. *, H. E. Jeffries and **Vizuete, W.**[C] (2013). "Houston's Rapid Ozone Increases: Preconditions and Geographic Origins." Environmental Chemistry **10**(3): 260-268.
53. Weir, C. *, K. Yeatts, **Vizuete, W.**, S. London, P. Salo, R. Jaramillo and D. Zeldin (2012). "Ambient Air Pollution and Allergic Sensitization: Results from the National Health and Examination Survey (NHANES) 2005-2006." The Journal of Allergy and Clinical Immunology **129**(2): AB19.
54. Parikh, H. M. *, A. G. Carlton, Y. Zhou, H. F. Zhang, R. M. Kamens and **Vizuete, W.**[C] (2012). "Modeling Secondary Organic Aerosol Formation from Xylene and Aromatic Mixtures Using a Dynamic Partitioning Approach Incorporating Particle Aqueous-Phase Chemistry (II)." Atmospheric Environment **56**: 250-260.
55. Lichtveld, K., S. Ebersviller, K. Sexton, **Vizuete, W.**, J. H.E. and I. Jaspers (2012). "*In Vitro* Exposures in Diesel Exhaust Atmospheres: Resuspension of PM from Filters Verses Direct Deposition of PM from Air." Environmental Science & Technology **46**(16): 9062-9070.
56. Henderson, B. *, R. Pinder, J. Crooks, R. Cohen, A. Carlton, H. Pye and **Vizuete, W.**[C] (2012). "Combining Bayesian Methods and Aircraft Observations to Constrain the HO + NO2 Reaction Rate." Atmospheric Chemistry and Physics **12**(2): 653-667.
57. Couzo, E. *, A. Olatosi, H. E. Jeffries and **Vizuete, W.**[C] (2012). "Assessment of a Regulatory Model's Performance Relative to Large Spatial Heterogeneity in Observed Ozone in Houston, Texas." Journal of the Air & Waste Management Association **62**(6): 696-706.
58. **Vizuete, W.**[C], H. E. Jeffries, T. W. Tesche, E. P. Olaguer and E. Couzo * (2011). "Issues with Ozone Attainment Methodology for Houston, TX." Journal of the Air & Waste Management Association **61**(3): 238-253.
59. Parikh, H. M. *, A. G. Carlton, **Vizuete, W.** and R. M. Kamens (2011). "Modeling Secondary Organic Aerosol Using a Dynamic Partitioning Approach Incorporating Particle Aqueous-Phase Chemistry." Atmospheric Environment **45**(5): 1126-1137.
60. Henderson, B. H. *, R. W. Pinder, J. Crooks, R. C. Cohen, W. T. Hutzell, G. Sarwar, W. S. Goliff, W. R. Stockwell, A. Fahr, R. Mathur, A. G. Carlton and **Vizuete, W.**[C] (2011). "Evaluation of Simulated Photochemical Partitioning of Oxidized Nitrogen in the Upper Troposphere." Atmospheric Chemistry and Physics **11**(1): 275-291.
61. Henderson, B. H. *, Y. Kimura, E. McDonald-Buller, D. T. Allen and **Vizuete, W.**[C] (2011). "Comparison of Lagrangian Process Analysis Tools for Eulerian Air Quality Models." Atmospheric Environment **45**(29): 5200-5211.
62. **Vizuete, W.**[C], L. Biton *, H. E. Jeffries and E. Couzo (2010). "Evaluation of Relative Response Factor Methodology for Demonstrating Attainment of Ozone in Houston, Texas." Journal of the Air & Waste Management Association **60**(7): 838-848.
63. Li, Y., J. M. Gibson, P. Jat, G. Puggioni, M. Hasan, J. J. West, **Vizuete, W.**, K. Sexton and M. Serre (2010). "Burden of Disease Attributed to Anthropogenic Air Pollution in the United Arab Emirates: Estimates Based on Observed Air Quality Data." Science of The Total Environment **408**(23): 5784-5793.
64. Henderson, B. H. *, H. E. Jeffries, B.-U. Kim and W. G. **Vizuete**[C] (2010). "The Influence of Model Resolution on Ozone in Industrial Volatile Organic Compound Plumes." Journal of the Air & Waste Management Association **60**(9): 1105-1117.
65. Xu, Y. *, **Vizuete, W.** and M. Serre (2009). "Characterization of Air Quality Ozone Model Performance Using Land Use Regression Model: An Application in Exposure Assessment for Epidemiology Studies." Perspectives **117**(4): 537-544.
66. Olaguer, E. P., B. Rappengluck, B. Lefer, J. Stutz, J. Dibb, R. Griffin, W. H. Brune, M. Shauck, M. P. Buhr, H. Jeffries, **Vizuete, W.** and J. Pinto (2009). "Deciphering the Role of Radical Precursors during the Second Texas Air Quality Study." Journal of the Air & Waste Management Association **59**(11): 1258-1277.
67. **Vizuete, W.**[C], B.-U. Kim, H. Jeffries, Y. Kimura, D. T. Allen, M.-A. Kioumourtzoglou, L. Biton and B. Henderson (2008). "Modeling Ozone Formation from Industrial Emission Events in Houston, Texas." Atmospheric Environment **42**(33): 7641-7650.

68. Song, J., **Vizuete, W.**, S. Chang, D. Allen, Y. Kimura, S. Kemball-Cook, G. Yarwood, M.-A. Kioumourtzoglou, E. Atlas, A. Hansel, A. Wisthaler and E. McDonald-Buller (2008). "Comparisons of Modeled and Observed Isoprene Concentrations in Southeast Texas." Atmospheric Environment **42**(8): 1922-1940.
69. Nam, J., M. Webster, Y. Kimura, H. Jeffries, **Vizuete, W.** and D. T. Allen (2008). "Reductions in Ozone Concentrations Due to Controls on Variability in Industrial Flare Emissions in Houston, Texas." Atmospheric Environment **42**(18): 4198-4211.
70. Kimura, Y., E. McDonald-Buller, **Vizuete, W.** and D. T. Allen (2008). "Application of a Lagrangian Process Analysis tool to Characterize Ozone Formation in Southeast Texas." Atmospheric Environment **42**(23): 5743-5759.
71. Webster, M., J. Nam, Y. Kimura, H. Jeffries, **Vizuete, W.** and D. T. Allen (2007). "The Effect of Variability in Industrial Emissions on Ozone Formation in Houston, Texas." Atmospheric Environment **41**(40): 9580-9593.
72. Nam, J., Y. Kimura, **Vizuete, W.**, C. Murphy and D. T. Allen (2006). "Modeling the Impacts of Emission Events on Ozone Formation in Houston, Texas." Atmospheric Environment **40**(28): 5329-5341.
73. Junquera, V., M. M. Russell, **Vizuete, W.**, Y. Kimura and D. Allen (2005). "Wildfires in Eastern Texas in August And September 2000: Emissions, Aircraft Measurements, and Impact on Photochemistry." Atmospheric Environment **39**(27): 4983-4996.
74. **Vizuete, W.**, V. Junquera and D. T. Allen (2004). "Sesquiterpene Emissions and Secondary Organic Aerosol Formation Potentials for Southeast Texas Special Issue of Aerosol Science and Technology on Findings from the Fine Particulate Matter Supersites Program." Aerosol Science and Technology **38**(Suppl 1): 167-181.
75. **Vizuete, W.**, V. Junquera, E. McDonald-Buller, G. McGaughey, G. Yarwood and D. Allen (2002). "Effects of Temperature and Land Use on Predictions of Biogenic Emissions in Eastern Texas, USA." Atmospheric Environment **36**(20): 3321-3337.
76. Barnett, W. M., R. G. Baughman, H. L. Collier and **Vizuete, W.** (1999). "Synthesis and Crystal Structure of 1, 1′-Di (Ethylpropionato)-2, 2′-Biimidazole, A Macromolecular Precursor." Journal of Chemical Crystallography **29**(7): 765-768.

Patents

- United States patent serial no. 13/559,004 for Systems and Methods for Collecting and Depositing Particulate Matter onto Tissue Samples 2013

Estimated concentrations of biogenic volatile organic compounds from an outdoor *Cannabis* farm

Final Report

Prepared for:
Canna Rios, LLC
3205 White Rock Lane
Santa Maria, CA 93454

Attention:
Mr. Brandon Gesicki
Patriot Management
Canna Rios, LLC Project
PO Box 3074
Orcutt, CA 93457
cannariosllc@gmail.com
831-206-6460

Prepared by:
Dr. William Vizuete
Chief Scientific Officer
Byers Emissions Analysis
will.v@byers-scientific.com

December 9, 2021

Table of Contents

List of Figures

List of Tables

Executive Summary

The purpose of this study was to determine whether it is feasible for monoterpene emissions from cannabis from the proposed project (3205 White Rock Lane Santa Maria, CA 93454) to contribute to the formation of ground-level ozone based on a regulatory air quality model to predict the ozone impacts on the region.

To run our model, we completed the following task:

1) Prediction of gas-phase concentrations using the cannabis farm's emission rates simulated over three (3) years using local meteorology data.

Our modeling was based on the size and location of the proposed project – 3205 White Rock Lane, Santa Maria, CA 93454 – and utilized local meteorological data from the Santa Maria (KSMX) airport with upper air data from the Oakland International (KOAK) airport.

The below describes the results and major findings of the estimation of the cannabis farm emissions contribution to ozone.

- Model predictions shows negligible impacts on ambient daily eight (8) hour maximum ozone concentrations from cannabis cultivation emissions.

Goal

The goal of this work was to determine regional air quality impacts due to ambient ozone generation.

1) Using measurement-based emission factors from leaf enclosures for five (5) different strains of cannabis to estimate emission rates for the proposed cannabis farm based on the anticipated canopy size
2) Predict contributions to regional ozone using EPA-approved regulatory air quality model

Details on the methodology used in these tasks and results are described below.

1: Emission rates for *Cannabis* Farm

Canna Rios, LLC reported 745,620 square feet of cannabis cultivation denoted in red on Figure 1. The client reported that the cultivation will be evenly distributed among five (5) strains: Member Berry, Forbidden Fruit, Gorilla Glue, Presidential OG and Wedding Cake. Assuming a biomass density of 1,500 g/m^2 for each strain, and using measured emission factors, emission rates of 1,8-cineole were determined from the proposed cannabis farm. It was determined that the farm would emit 3,332 g/hr of total biogenic volatile organic compounds of which 0.446 g/hr was 1,8-cineole. It was also estimated that the facility would produce 0.909 g/hr of 3-methyl-2-butene-1-thiol. The client reported 2.9 acres of buffer landscaping which was included in this modeling as a reduction in emissions. Concentrations at point 1 in Figure 1 were used with deposition velocities described below to calculate a loss rate due to buffer landscaping. This was included in all modeling presented here.

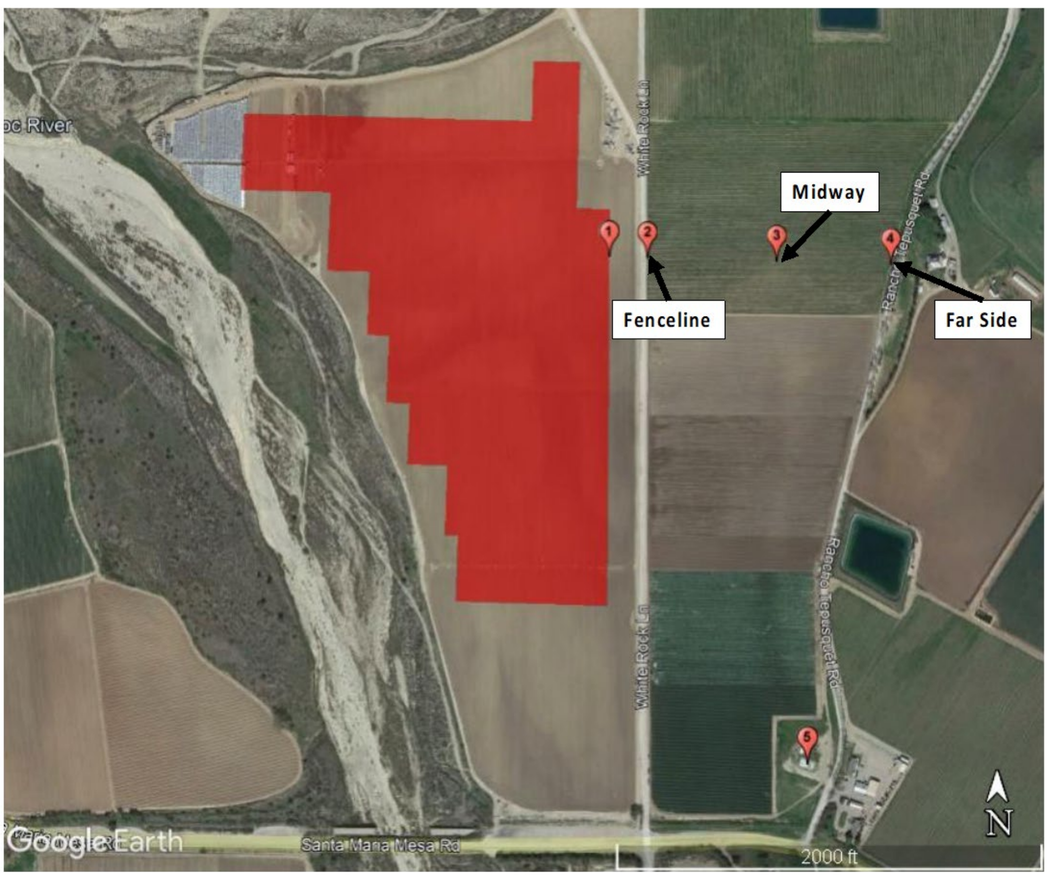


Figure 1. The location of the farm, modeled as an area source, shown as a red shade. Also shown are the three (3) receptor locations (fenceline, midway, far side) where model predictions were made.

2: Modeling Systems for Predicted Gas-Phase Concentrations

2a: Air Quality Model

Regional air quality modeling was performed using the Community Multiscale Air Quality (CMAQ) model to determine the ozone (O_3) impacts from terpene emissions from a proposed cannabis cultivation site. CMAQ is a state-of-the-art air quality model developed and maintained by the U.S. Environmental Protection Agency (EPA) [1]. It includes multiple atmospheric processes, including but not limited to, emissions, chemistry, deposition, and transport and has shown good model performance in predicting atmospheric O_3 mixing ratios [2]. Here, July 2016 12km continental US CMAQ model inputs were obtained from the University of North Carolina's Community Modeling and Analysis System (CMAS) Data Warehouse [3]. Figure 2 shows the location of the receptors in the CMAQ grid cell.

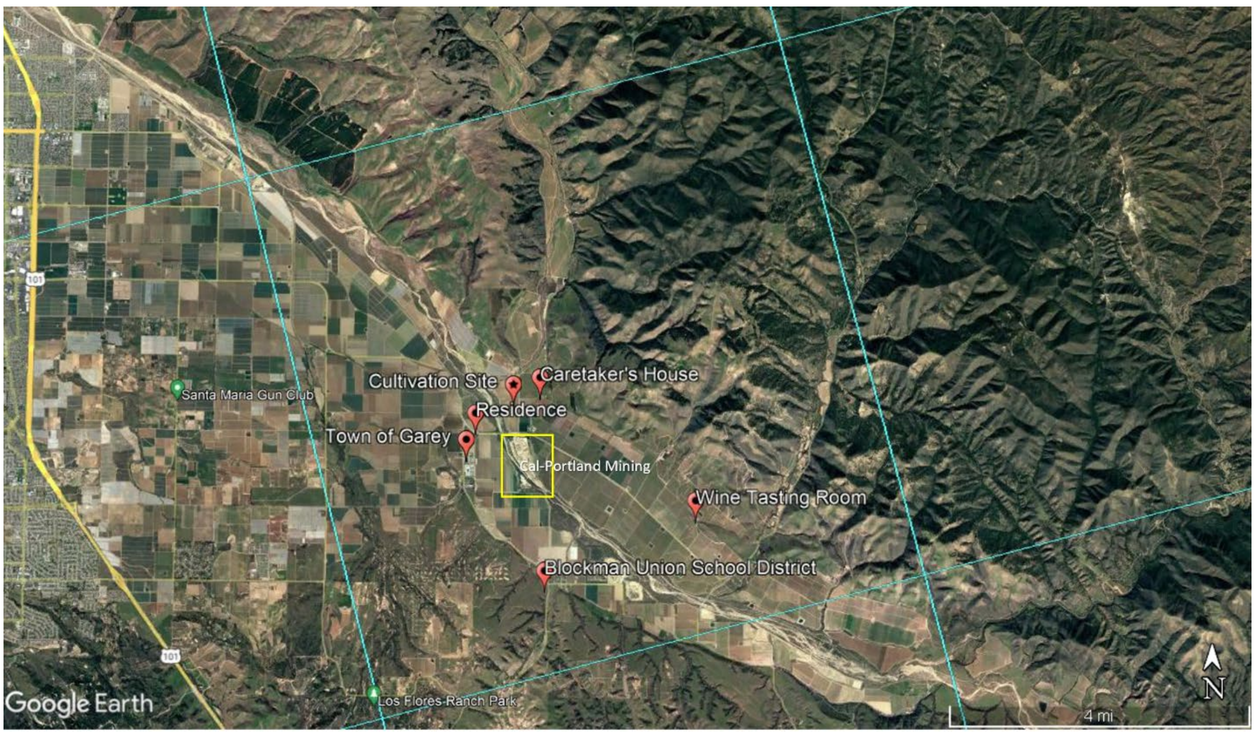


Figure 2. 12km CMAQ grid cell containing the cultivation site used to determine the O_3 impacts from the cultivation site's terpene emissions. Yellow box indicates Cal-Portland Mining Company showing its proximity to the neighboring property (appellant).

Using those inputs, July 2016 was modeled in CMAQ to determine a baseline (or base case) O_3 mixing ratio in the proposed cannabis cultivation site. Table 1 provides the details of the CMAQ modeling configuration.

Table 1. CMAQ model configuration.

CMAQ Version	v5.3.3 (Released August 2021)
Modeling Period	July 2016
Meteorological Inputs	Weather Research Forecast (WRF) Model v3.8
CMAQ Grid Resolution	12km x 12km
CMAQ Chemical Mechanism	Carbon Bond 6, Revision 3 (cb6r3)
Emissions	2016 National Emissions Inventory (NEI)
Additional Options	Inline Lightning NOx Inline Biogenic Emissions

The July 2016 O_3 model results were compared against monitoring results from a nearby monitor in Santa Maria, CA (EPA Air Quality System monitor 060831008; located at 34.942872-120.435611). The monitor is located approximately eight (8) miles to the northwest of the cultivation site and was used to evaluate model performance and determine a suitable day to assess the O_3 impacts from the cultivation site. July 3, 2016 was identified as the best day in July 2016 as it had the highest one (1)-hr max (41 ppb) and eight (8)-hr max average (39 ppb) monitored O_3 values. CMAQ also showed excellent O_3 model performance on this day, matching the eight (8)-hr average monitored O_3 (39 ppb) and nearly matching the one (1)-hr max (40 ppb modeled, 41 ppb measured).

2. Impacts on Ozone

Table 2 provides the hourly O_3 mixing ratios in the base case described above and a new simulation with the proposed farm labelled sensitivity. Also shown are the maximum one (1)-hr and eight (8)-hr mixing ratios for both scenarios. The maximum increase in one (1)-hr mixing ratios in the sensitivity case was 0.016 ppb, or 16 ppt. This had only a 1 ppt impact on the daily one (1)-hr or eight (8)-hr max O_3 values. The base case had a slightly higher one (1)-hr max and eight (8)-hr max due to chemical destruction of O_3 by reactions with farm emissions.

Table 2. Hourly modeled O_3 mixing ratios (ppb) for the base case (all sources except the cultivation site) and sensitivity case (all sources plus the cultivation site).

Day and Time	Base O_3 (ppb)	Sensitivity O_3 (ppb)	Difference (Sensitivity – Base) (ppb)
July 3, 12 AM	23.540	23.538	-0.002
July 3, 1 AM	21.027	21.023	-0.004
July 3, 2 AM	20.486	20.477	-0.009
July 3, 3 AM	18.530	18.514	-0.016
July 3, 4 AM	16.049	16.028	-0.021
July 3, 5 AM	14.819	14.796	-0.023
July 3, 6 AM	13.952	13.932	-0.020
July 3, 7 AM	17.009	16.997	-0.012
July 3, 8 AM	26.937	26.953	0.016
July 3, 9 AM	32.013	32.024	0.011
July 3, 10 AM	34.844	34.847	0.003
July 3, 11 AM	37.728	37.727	-0.001
July 3, 12 PM	39.581	39.579	-0.002
July 3, 1 PM	40.254	40.253	-0.001
July 3, 2 PM	40.014	40.013	-0.001
July 3, 3 PM	39.169	39.168	-0.001
July 3, 4 PM	38.253	38.252	-0.001
July 3, 5 PM	37.719	37.719	0
July 3, 6 PM	37.310	37.310	0
July 3, 7 PM	36.399	36.399	0
July 3, 8 PM	34.984	34.985	0.001
July 3, 9 PM	33.440	33.440	0
July 3, 10 PM	31.469	31.468	-0.001
July 3, 11 PM	28.666	28.665	-0.001
8-hr Max	38.754	38.753	-0.001
1-hr Max	40.254	40.253	-0.001

Reference:

1. EPA. *CMAQ: The Community Multiscale Air Quality Modeling System version 5.3.2*. 2021 [cited 2021; Available from: https://www.epa.gov/cmaq.
2. Appel, K.W., et al., *The Community Multiscale Air Quality (CMAQ) model versions 5.3 and 5.3. 1: system updates and evaluation.* Geoscientific Model Development, 2021. **14**(5): p. 2867-2897.
3. EPA, *CMAQ Model Version 5.3 Input Data -- 1/1/2016 - 12/31/2016 12km CONUS*, EPA, Editor. 2019: UNC Dataverse.