ARBORIST REPORT

Assessment of 14 Eucalyptus Stands
Locations, Attributes, Fire Hazards, Treatments & Priorities
Bolinas, California

Prepared for:
Wildfire Safe Bolinas

Prepared by:
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EXECUTIVE SUMMARY

A wind-driven wildfire burning into Bolinas from the north will likely block evacuation routes and fuel intense burning conditions that would threaten dense residential areas and result in unnecessary loss of life. This threat could be proactively addressed by treating select stands of fire-prone eucalyptus to create safer evacuation routes, and to improve both firefighter effectiveness and safety while they defend the property and people of Bolinas. These treatments could include modification of overgrown, largely untended eucalyptus stands by clearing dense understory brush, pruning lower tree limbs, thinning trees to reduce stand density, and native habitat restoration. Eucalyptus removal and native oak woodland restoration for all of the 14 stands evaluated in this report is recommended as the preferred long-term sustainable approach to mitigate this fire threat.

ASSIGNMENT

Wildfire Safe Bolinas hired ARBORSCIENCE, LLC to evaluate 14 bluegum eucalyptus stands that collectively occupy 70 acres in Bolinas. The locations and attributes of these stands were evaluated with respect to fire hazards they present and management priorities to mitigate these hazards. I inspected these stands on March 5 and 12, 2021.

SCOPE OF WORK AND LIMITATIONS

This assessment is based on the circumstances and observations, as they existed at the time of the site inspection. Opinions in this assessment are given based on observations made and using generally accepted professional judgment, however, because trees are living organisms and subject to change, damage and disease, the results, observations, recommendations, and analysis as set out in this assessment are valid only at the date any such observations and analysis took place and no guarantee, warranty, representation or opinion is offered or made by Arborscience as to the length of the validity of the results, observations, recommendations and analysis contained within this assessment. As a result Wildfire Safe Bolinas shall not rely upon this assessment, save and except for representing the circumstances and observations, analysis and recommendations that were made as at the date of such inspections. It is recommended that stands discussed in this assessment should be re-assessed periodically.

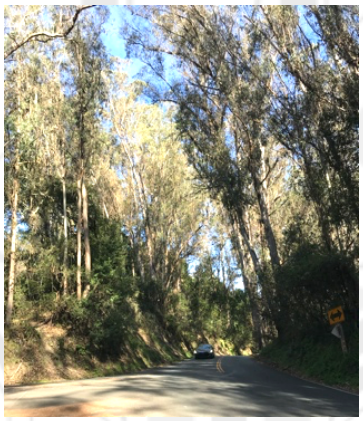
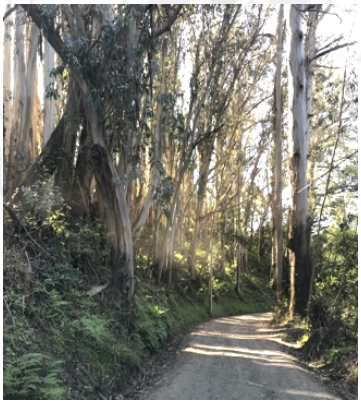
BALANCING RISKS AND REWARDS

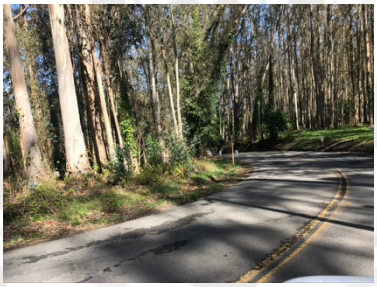
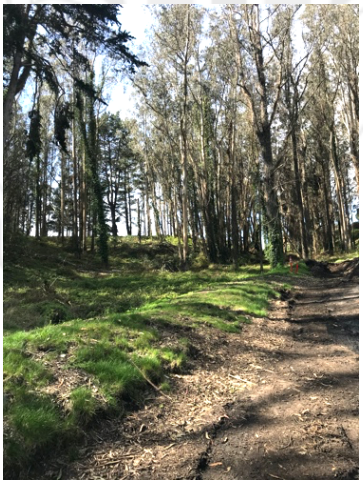
Bluegum eucalypts are fast growing, invasive trees that dominate our native plant communities by usurping sunlight, nutrients, and water. They also create a high fire hazard due to accumulations of dead leaves, hanging and fallen bark, and branches that collect in the understory. Their leaves are high in volatile oils and are easily carried downwind during a wildfire incident to ignite spot fires. Eucalypt sprouts and saplings add to this understory fuel and bridge the space between the ground and tree canopy as “ladder fuels” that support “crown fires.” Bluegum eucalypts also create wildlife habitat, cast shade, reduce winds, present striking beauty, store carbon, and offer a

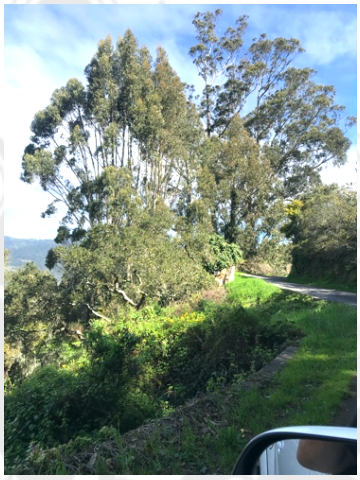
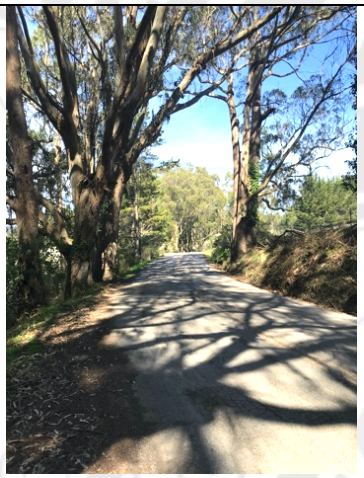
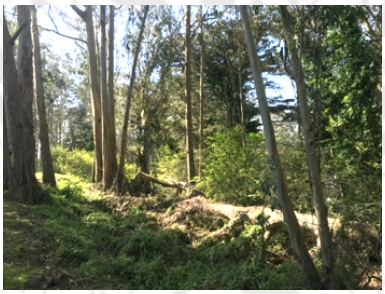
reminder of home. Finding the balance between our tolerance of risk and other values these trees present drives management decisions.

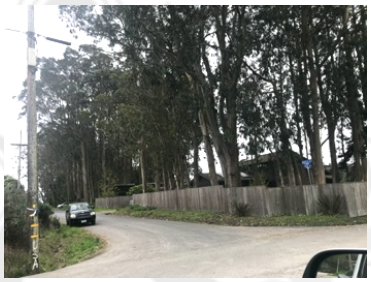
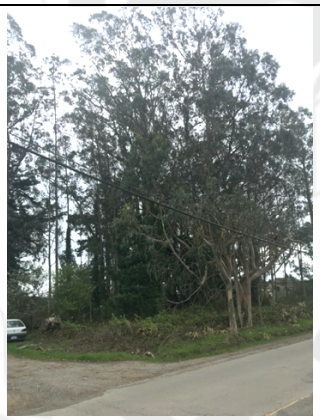
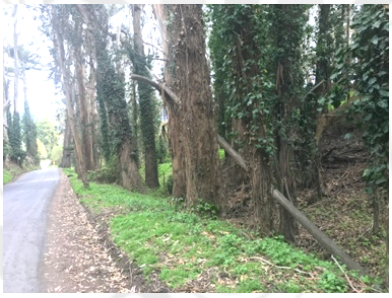
STAND DESCRIPTIONS

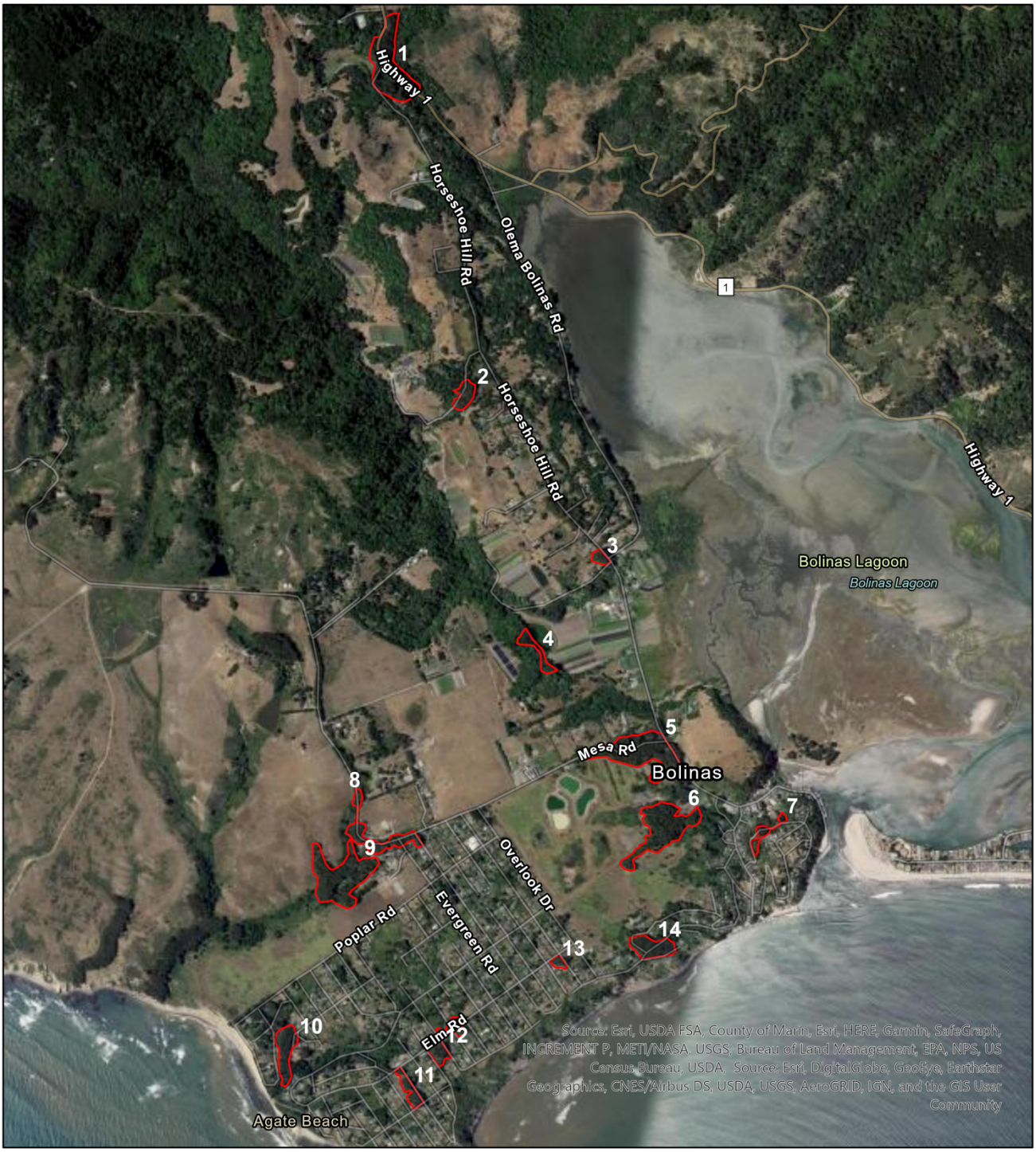
The 14 subject stands range in size from 1 to 12 acres and collectively occupy 70 acres. These stands are dominated by bluegum eucalypts (*Eucalyptus globulus*) that were initially planted along roadways, as windbreaks, or are volunteers that seeded in from these initial plantings. Most of the eucalyptus trees in Bolinas have been severely defoliated by Eucalyptus Tortoise Beetles. Other trees in these stands include Douglas-fir (*Pseudotsuga menziesii*), Coast live oak (*Quercus agrifolia*), California bay (*Umbellularia californica*), Monterey cypress (*Hesperacyparis macrocarpa*), Monterey pine (*Pinus radiata*), and acacia (*Acacia* spp.). Common understory shrubs include California coffeeberry (*Frangula californica*), Pacific poison-oak (*Toxicodendron diversilobum*), Himalayan berry (*Rubus armeniacus*), and Pacific blackberry (*Rubus ursinus*). Climbing, viny plants in these stands include cape ivy (*Delairea odorata*) and English ivy (*Hedra helix*). In the absence of disturbance—fire or mechanical clearing—these stands densify and accumulate loosely packed wildland fuels and become difficult to extinguish once ignited. These stands are described below, mapped on page 7, and then prioritized for treatment in Table 1 on page 8. Table 2 lists Marin Assessor Parcel Numbers for each stand (Attached).

No.	Location	Size (ac.)	Photo	Notes
1	HWY 1, Horseshoe Hill Road	11		Dense stand of large roadside eucalypts that have spread both uphill and downhill across a drainage. Native trees include California bay, coast live oak and Douglas-fir. The understory is dense with heavy fuel loading. Above-ground electrical distribution wires with transformer are present. Located at confluence of 2 primary evacuation routes for Bolinas.
2	Paradise Valley Road	2		Dense stand of small to large eucalypts on both sides of the road with coast live oak, California bay, and Douglas-fir intermixed. The understory is dense with heavy fuel loading. A drainage parallels the road downslope to the northwest. Above-ground communication wires pass above the road and electrical wires skirt the western stand boundary. Sole evacuation route for Paradise Valley.

No.	Location	Size (ac.)	Photo	Notes
3	Horseshoe Hill Road, Lauff Ranch Road, Olema-Bolinas Road	1		Dense roadside stand of moderate-size eucalypts intermixed with plum trees on the west side of the road. The understory is dense with heavy fuel loading. Above-ground electrical and communication wires pass by the stand across Horseshoe Hill Road. Located at the confluence of 2 primary evacuation routes for Bolinas.
4	Star Route Farm	2		Dispersed groves of large eucalypts growing on the eastern edge of a mixed evergreen forest and west of agricultural fields.
5	Mesa, Olema Bolinas	12		Moderately dense stand including large roadside and smaller interior eucalypts. Treated understory south of Mesa Road and largely untreated understory north of the Mesa Road. Above-ground electrical and communication wires pass through the stand. Located at confluence of 2 primary evacuation routes for Bolinas.
6	Bolinas-Stinson Resource Recovery Project Site	10		Dense stand of small to moderate size eucalypts with canyon topography. Understory vegetation upslope of Resource Recovery building has been removed. Other areas have dense understory vegetation with heavy fuels and steep slopes.

No.	Location	Size (ac.)	Photo	Notes
7	Altura Avenue	1		Several groves of small to large eucalypts intermixed with Monterey pine on both sides of the steep one-way road. Unmanaged understories with heavy fuels. Ridge topography where high winds are common.
8	Dogwood Road, Evergreen Road, Mesa Road	5		Roadside eucalypts of small to large sizes intermixed with rows of Monterey cypresses and disbursed Monterey pines. Above-ground electrical and communication wires pass through the stand. Evacuation route for Mesa Road, Point Reyes Bird Observatory, and Palomarin Beach and Trailhead.
9	Purple Gate Road	12		Dense stand of small to large eucalypts intermixed with Monterey cypress and plum trees in a canyon topography setting. Mix of understory clearing intensity, but generally heavy ground fuels.
10	Yucca Road, Ocean Parkway, Larch Road	4		Dense stand of medium to large eucalypts in a canyon topography setting. Heavy untreated ground fuels.

No.	Location	Size (ac.)	Photo	Notes
11	Elm Road, Maple Road, Cherry Drive	2		Dense stand of small to large eucalypts in level residential setting. Understory mostly unkempt with heavy fuels except for fenced yards where small trees have been removed and brush controlled.
12	Kale Road, Elm Road, Iris Road, Hawthorne Road	3		Dense stand of small to moderate size eucalypts intermixed with green wattle acacia and Monterey pine in a level residential setting. Untreated understory with heavy fuels.
13	Aspen Road, Elm Road	1		Dense stand of smaller eucalypts intermixed with Monterey pine in a level residential setting. Untreated understory with heavy fuels.
14	Terrace Avenue, Ocean Parkway, Marin Way	4		Dense stand of medium to large roadside eucalypts that have spread uphill on both sides of the road. The understory is dense with heavy fuel loading. Above-ground electrical distribution wires with transformer and communication wires are present. Terrace Avenue is a critical alternate evacuation route should Mesa Road be blocked or impassible due to fire.



ARBORSCIENCE, LLC
Sound Tree Advice

0 0.25 0.5 1 Miles

N

14 Bluegum Eucalyptus Stands
Wildfire Safe Bolinas
Bolinas California

To prioritize the treatment of stands in this assessment, the subject stands were assigned one of three themes and then sorted by relative importance. Themes included (1) Stands Along Primary Community **Evacuation Routes** (sorted by most to least number of residents that would use these routes to evacuate), (2) **Large Stands** with Canyon Topography north of heavily populated areas (sorted by most to least number of homes potentially affected during a northeast wind-wildfire event), and (3) **Small Stands** (sorted by most to least number of homes potentially affected by a northeast wind-wildfire event). For example, Stand 1 received the highest ranking (A) for treatment among those stands in the Evacuation Route Theme because most north-bound traffic leaving Bolinas passes through this stand. Stand 9 received the highest ranking (G) for treatment among those Large Stands with Canyon Topography because most of the Mesa could be affected by a fire moving from the north. Stand 7 received the highest ranking (J) for treatment among the smaller more isolated stands because it is positioned in an area that could affect most of the Little Mesa.

Table 1. List of subject stands in Bolinas by number, location, size, theme, ranking, and recommended treatment.

Stand	Stand Location	Acres	Theme	Ranking	Treatment
1	HWY 1, Horseshoe Hill	11	Evacuation	A (highest)	Woodland Restoration
3	Horseshoe Hill, Lauff Ranch, Olema-Bolinas	1	Evacuation	B	Woodland Restoration
5	Mesa Road, Olema-Bolinas Road	12	Evacuation	C	Woodland Restoration
14	Terrace Ocean Marin	4	Evacuation	D	Woodland Restoration
8	Dogwood Evergreen Mesa	5	Evacuation	E	Woodland Restoration
2	Paradise Valley	2	Evacuation	F	Woodland Restoration
9	Purple Gate Road	12	Large Stand	G	Woodland Restoration
6	Resource Recovery Project Site	10	Large Stand	H	Woodland Restoration
10	Yucca Ocean Larch	4	Large Stand	I	Woodland Restoration
7	Altura	1	Small Stand	J	Woodland Restoration
13	Aspen Elm	1	Small Stand	K	Woodland Restoration
12	Kale Elm Iris Hawthorne	3	Small Stand	L	Woodland Restoration
11	Elm Maple Cherry	2	Small Stand	M	Woodland Restoration
4	Star Route Farm	2	Small Stand	N (lowest)	Woodland Restoration

Cleaning. Selectively removing understory shrubs (retaining well-spaced native shrubs and small trees) and clearing accumulated leaves, bark, and limbs.

Crown Fire. A fire that has moved up from the ground into the forest canopy and is spreading through it, usually in conjunction with the surface fuels.

Ladder Fuel. Plants that provide vertical continuity between strata, thereby allowing fire to move from surface fuels into the crowns of trees. They help initiate and assure the continuation of crowning.

Pruning. Removing lower limbs to a height of 10-15' to limit fire spread from ground fuels into tree crowns.

Stand. A contiguous community of trees that are relatively uniform in composition, age, size, spatial arrangement, and condition.

Stump Management. Grinding or tarping stumps to prevent regrowth from sprouts. This is a preferred alternative to application of herbicide which is toxic and can spread to other trees through root grafts.

Thinning. Reducing the number of trees in a stand by selectively removing small trees that serve as ladder fuels and larger trees to separate aerial fuels.

Wildland Fuel. Plant materials that are available for consumption during a fire event. They include 1-hour dead fuels less than 0.25-inch in diameter such as grass and pine needles that respond most quickly to changing weather conditions, 10-hour dead fuels in the 0.25" to 1" diameter range including branches and surface litter to 1" deep that respond quickly to changing weather conditions, and 100-hour dead fuels in the 1" to 3" branch diameter range, and 1,000-hour dead fuels that include dead limbs and trunks from 3" to 8" in diameter. Live plant materials can also be available to fuel a wildfire and their availability depends on their arrangement, moisture content, and presence of volatile oils or waxes.

Windbreak. A row of trees that present a partial barrier to wind. The effectiveness of this barrier is related to height and density. Windbreaks affect the downwind environment for a distance of one-and-one-half times the height of trees.

Woodland Restoration. Removing eucalypts to favor redevelopment of a native oak woodland plant community. Work includes understory cleaning, stump management, and new tree and shrub establishment. Maintenance includes control of unwanted plants (e.g., eucalypts, broom) and care of desired trees and shrubs.

CONCLUSIONS AND RECOMMENDATIONS

Wildfires burning into Bolinas from the north will likely block evacuation routes and fuel intense burning conditions that would threaten dense residential areas and likely result in unnecessary loss of life. This wildfire threat could be proactively addressed by treating these stands to create safer evacuation routes, and to improve both firefighter effectiveness and safety while they defend the property and people of Bolinas.

While treatments could include modification of these overgrown, largely untended eucalyptus stands by clearing dense understory brush, pruning lower tree limbs, thinning trees to reduce stand density, these measures do not fully address the long-term maintenance burden of managing these highly invasive fire-prone trees. I recommend that a eucalyptus removal and native oak woodland restoration approach be adopted to manage these stands for community safety.

Sincerely,

ARBORSCIENCE, LLC

Dr. Kent R. Julin
ISA Certified Arborist #WE-8733A
ISA Tree Risk Assessor Qualified
California Registered Professional Forester #2648

Table 2. List of subject stands by assessor parcel.

Number	Location	Assessor Parcel No.
1	HWY 1 Horseshoe Hill	188-140-49
1	HWY 1 Horseshoe Hill	188-090-13
1	HWY 1 Horseshoe Hill	188-110-09
1	HWY 1 Horseshoe Hill	188-140-71
1	HWY 1 Horseshoe Hill	188-140-74
2	Paradise Valley	188-140-12
2	Paradise Valley	188-140-54
2	Paradise Valley	188-150-86
2	Paradise Valley	188-140-53
3	Horseshoe Hill Lauff Ranch Olema Bolinas	188-150-57
3	Horseshoe Hill Lauff Ranch Olema Bolinas	188-150-58
4	Star Route Farm	193-010-19
5	Mesa Olema Bolinas	193-020-51
5	Mesa Olema Bolinas	193-020-41
5	Mesa Olema Bolinas	193-020-61
5	Mesa Olema Bolinas	193-030-38
5	Mesa Olema Bolinas	193-020-25
6	Resource Recovery	193-030-38
6	Resource Recovery	193-030-28
6	Resource Recovery	193-030-03
6	Resource Recovery	193-074-12
7	Altura	193-092-20
7	Altura	193-092-21
7	Altura	193-075-03
7	Altura	193-081-01
7	Altura	193-081-36
7	Altura	193-081-38
7	Altura	193-075-04
7	Altura	193-081-02
8	Dogwood Evergreen Mesa	192-032-02
8	Dogwood Evergreen Mesa	192-032-03
8	Dogwood Evergreen Mesa	192-032-01
8	Dogwood Evergreen Mesa	188-170-29
8	Dogwood Evergreen Mesa	192-270-01
8	Dogwood Evergreen Mesa	188-170-62
8	Dogwood Evergreen Mesa	192-042-01
8	Dogwood Evergreen Mesa	192-031-54
8	Dogwood Evergreen Mesa	192-270-04
8	Dogwood Evergreen Mesa	192-270-02
8	Dogwood Evergreen Mesa	192-042-36
8	Dogwood Evergreen Mesa	192-021-04
8	Dogwood Evergreen Mesa	192-042-46
8	Dogwood Evergreen Mesa	188-170-19

Number	Location	Assessor Parcel No.
8	Dogwood Evergreen Mesa	192-021-05
8	Dogwood Evergreen Mesa	188-170-21
9	Purple Gate	192-270-01
9	Purple Gate	192-031-55
9	Purple Gate	188-170-62
9	Purple Gate	192-270-05
9	Purple Gate	192-270-04
9	Purple Gate	192-270-02
9	Purple Gate	188-170-12
9	Purple Gate	188-170-61
9	Purple Gate	188-170-19
10	Yucca Ocean Larch	190-101-05
10	Yucca Ocean Larch	190-171-13
10	Yucca Ocean Larch	190-092-08
10	Yucca Ocean Larch	190-171-08
10	Yucca Ocean Larch	190-092-04
10	Yucca Ocean Larch	190-101-04
10	Yucca Ocean Larch	190-171-09
10	Yucca Ocean Larch	190-092-05
10	Yucca Ocean Larch	190-092-07
10	Yucca Ocean Larch	190-022-05
10	Yucca Ocean Larch	190-092-02
10	Yucca Ocean Larch	190-022-06
10	Yucca Ocean Larch	190-022-12
10	Yucca Ocean Larch	190-101-02
10	Yucca Ocean Larch	190-171-14
10	Yucca Ocean Larch	190-092-01
10	Yucca Ocean Larch	190-101-03
10	Yucca Ocean Larch	190-111-18
10	Yucca Ocean Larch	190-171-20
10	Yucca Ocean Larch	190-092-06
10	Yucca Ocean Larch	190-092-03
10	Yucca Ocean Larch	190-101-01
11	Elm Maple Cherry	191-122-13
11	Elm Maple Cherry	191-122-06
11	Elm Maple Cherry	191-122-14
11	Elm Maple Cherry	191-122-03
11	Elm Maple Cherry	191-131-07
11	Elm Maple Cherry	191-131-13
11	Elm Maple Cherry	191-122-12
11	Elm Maple Cherry	191-122-05
11	Elm Maple Cherry	191-122-17
11	Elm Maple Cherry	191-131-06
11	Elm Maple Cherry	191-122-04

Number	Location	Assessor Parcel No.
11	Elm Maple Cherry	191-131-14
12	Kale Elm Iris Hawthorne	191-162-17
12	Kale Elm Iris Hawthorne	191-021-12
12	Kale Elm Iris Hawthorne	191-021-15
12	Kale Elm Iris Hawthorne	191-032-36
12	Kale Elm Iris Hawthorne	191-181-08
12	Kale Elm Iris Hawthorne	191-032-12
12	Kale Elm Iris Hawthorne	191-171-09
12	Kale Elm Iris Hawthorne	191-181-07
12	Kale Elm Iris Hawthorne	191-181-06
12	Kale Elm Iris Hawthorne	191-021-24
12	Kale Elm Iris Hawthorne	191-032-10
12	Kale Elm Iris Hawthorne	191-032-13
12	Kale Elm Iris Hawthorne	191-162-18
12	Kale Elm Iris Hawthorne	191-171-25
12	Kale Elm Iris Hawthorne	191-021-33
12	Kale Elm Iris Hawthorne	191-171-26
12	Kale Elm Iris Hawthorne	191-181-17
13	Aspen Elm	192-211-03
13	Aspen Elm	192-211-22
13	Aspen Elm	192-211-01
13	Aspen Elm	192-211-16
13	Aspen Elm	192-211-02
13	Aspen Elm	192-211-15
13	Aspen Elm	192-211-25
14	Terrace Ocean Marin	193-171-03
14	Terrace Ocean Marin	193-030-07
14	Terrace Ocean Marin	193-030-37
14	Terrace Ocean Marin	193-162-12
14	Terrace Ocean Marin	193-162-11
14	Terrace Ocean Marin	193-030-34
14	Terrace Ocean Marin	193-030-35
14	Terrace Ocean Marin	193-172-17
14	Terrace Ocean Marin	193-172-04