City of Lafayette Tree Root Assessment

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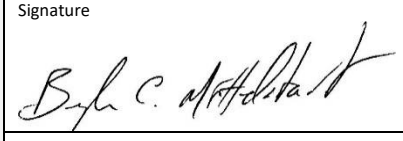
Prepared by	Signature 
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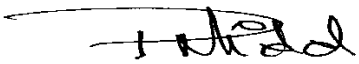
Approved by	Signature 
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Executive Summary

Pacific Gas and Electric (PG&E) retained Dynamic Risk Assessment Systems, Inc. (Dynamic Risk) to provide pipeline integrity subject matter expertise to support the PG&E and City of Lafayette (the city) Tree Assessment Process[1] to determine if selected trees within the PG&E Rights-of-Way (ROWs) located within the City should be removed. The Tree Assessment Process was implemented by the Tree Advisory Team[2], comprised of one (1) gas pipeline safety expert and one (1) arborist for each of PG&E and the City (the Experts). Ben Mittelstadt, of Dynamic Risk Assessment Systems Inc. (Dynamic Risk) fulfilled the role of gas pipeline safety expert for PG&E. This technical report provides the rationale and methodology applied in the development of recommendations, resulting from the meetings conducted by the Tree Advisory Team.

In summary, 207 trees were identified on the ROW as being within the scope of this assessment. The Arborists assessment identified 83 trees for removal based on poor health. An additional 48 trees were identified for removal based on an assessment of the potential for the trees to relatively increase integrity threats to the pipeline. In total, 131 of 207 trees were recommended for removal and 76 of 207 trees met the criteria to remain in place, subject to periodic threat susceptibility monitoring to confirm continued safe operation of the pipeline.

[1] City of Lafayette Staff Report, September 27, 2021, Proposed Tree Assessment Process as part of Settlement Discussions with PG&E regarding Removal of Trees within the City of Lafayette for the CPSI Project

[2] The Tree Advisory Team is defined in the City of Lafayette Staff Report

Contents

1 Introduction

In 2014, PG&E initiated a region wide program; the Pipeline Pathways project, which involved the removal of certain trees on and adjacent to PG&E gas transmission pipelines. Vegetation growth and structures located above and adjacent to natural gas pipelines can:

- interfere with safe access to PG&E natural gas pipeline facilities in order to conduct pipeline Operations and Maintenance (O&M) activities required by regulatory code,
- restrict access to safely operate and maintain pipelines and respond in the event of an emergency,
- impede ability of emergency responders to identify and access pipeline facilities,
- due to vegetation roots, directly impact the integrity of underground natural gas pipelines.

In 2018, the program, then referred to as the Community Pipeline Safety Initiative (CPSI), identified 207 trees, located within the City of Lafayette (the City), considered to pose an unacceptable threat to pipeline safety. Each of the 207 trees identified were located within a 5 feet lateral distance, either side of the pipeline.

In September of 2021, the City proposed a Tree Assessment Process to be applied to the 207 trees, with the objective of establishing the criteria for a tree risk assessment[3], conducting the risk assessment in application with the developed criteria, and subsequently providing a summary of trees for removal.

A series of seven (7) meetings were held by the Experts[4] during the time period November 2021 to May 2022, to discuss and develop the appropriate recommendations for disposition of the trees.

2 Pipeline Integrity Considerations

Prior work has shown that tree root interaction with pipelines increases the potential for pipeline failure through damage to external protective corrosion coatings, and by increasing the potential for external forces to be applied to the pipeline. Trees also obscure the right of way, potentially limiting the efficacy of air and ground patrol, the ability to access the pipeline, and the effectiveness of emergency response.

The American Society of Mechanical Engineers (ASME) B31.8S *Managing System Integrity of Gas Pipelines,* Supplement to the ASME B31 Design Code for Pressure Piping (B31.8), provides guidance on threat assessment for pipelines by categorizing integrity threats into nine categories (threats). The threats described in B31.8S provide a framework for a comprehensive assessment. The attributes of each threat have been considered with relation to pipe tree root interaction as shown in Table 1.

[3] "Risk Assessment" in this context is the qualitative evaluation of the likelihood of tree root interaction to increase the potential for pipeline loss of containment

[4] One (1) gas pipeline safety expert and one (1) arborist for each of PG&E and the City

Table 1: Potential for Threat Interaction Related to Tree Roots

Threat	Threat Description	Potential for Increased Threat Potential Related to Tree Roots?
External Corrosion	Damage to the pipeline due to contact with the environment. External corrosion occurs in areas where external coating is compromised, and cathodic protection systems are not effective.	Yes – damage to susceptible coatings and cathodic protection interference
Internal Corrosion	Damage to the pipeline due to corrosive internal conditions such as chemical corrosion, corrosive gas streams or water in the gas flow.	No
Stress Corrosion Cracking (Environmental Cracking)	Stress Corrosion Cracking is the formation of cracking due to the combination of a corrosive environment combined with tensile stress	Yes – like External Corrosion, due to coating failure an environment conducive to formation of SCC could exist, though the stress levels on the pipelines near the 207 trees (generally less than 30% of the Specified Minimum Yield Strength of the pipe) are such that the likelihood of SCC to initiate is considered to be remote
Manufacturing and Construction Related Defects	Manufacturing defects such as defective seams or flaws in the pipe body. Construction-related features such as brittle welds or welds that contain workmanship defects. These features would not be expected to grow over time unless acted upon by external forces.	Yes (due to Weather Related and Outside Forces)
Equipment	Failure of valves, seals, regulators, or other non-pipe components	No
Third Party Damage	Damage to the pipeline through excavation, encroachment, or vandalism.	Yes – decreased awareness of the pipeline, decreased ability to monitor for encroachments
Incorrect Operations	Operational factors affecting pipeline safety such failure to follow procedures leading to conditions as over pressurization	No
Weather Related and Outside Forces	Weather-related conditions such as earth movement, heavy rains or floods, lightning strikes.	Yes - Uprooting during flood or high winds and affecting the pipeline primarily by destabilizing construction features such as pipe joint (girth) welds

Based on the table above, three primary pipeline integrity threat considerations are considered in context of the potential for tree root interaction with buried pipelines: external corrosion, external loading conditions affecting the pipeline, and visibility of the pipeline right of way for the purposes of monitoring for encroachment and isolated third-party activities.

2.1 External Corrosion

External corrosion is the most significant integrity threat to transmission pipelines, representing approximately 37% of the causes of leaks[5] in High Consequence Areas (HCAs)[6], over the period 2004-2020[7]. Buried pipelines rely upon a combination of external coating and cathodic protection (CP) to mitigate this threat.

External coating isolates the pipeline steel from the local buried environment (i.e., soil, water), and cathodic protection applies an electrical current to the pipeline, polarizing the metallic surface to become more electronegative than the surrounding environment, thus interrupting the galvanic corrosion reaction if the pipeline steel is exposed to the environment due to coating damage. Damage to external coating or external coating deterioration over time, equates to the removal of a key protection element within the corrosion control system, resulting in sole reliance on the CP system for protection and increasing the potential for the initiation and growth of external corrosion. Prior work has indicated that CP can remain effective in the presence of tree roots, however it would overstate the conclusions of that work to assume an adequate level of effectiveness to be present in all cases and conditions. CP efficacy can be further influenced by many uncontrolled factors including moisture content and composition of the soil and can be interrupted or subject to interference due to power outages or nearby sources of stray current.

The use of external coatings in combination with CP can be considered a form of "defense-in-depth" which is a strategy using multiple layers of protection to mitigate the impact of a threat. This provides for redundancy and continued security where if one line of defense is compromised, other defense mechanisms exist to control the threat. It is recognized that external coatings can and do deteriorate over time due to the environments in which such coatings are installed, however CP systems also exhibit limitations, and managing the integrity of external coatings as a primary defense mechanism is widely recognized as a leading industry practice in the effective management of external corrosion.

2.2 Weather-Related and Outside Forces

Adverse weather conditions, such as strong winds, flooding, landslides, and seismic events, along with associated tree and root movement, can cause external loading on pipelines that exceed design specifications. This can lead to structural damage or exceed the strain capacity of girth welds that may contain workmanship flaws or exhibit brittle characteristics. In situations where the buried pipeline and tree root systems are interconnected, a lightning strike impacting the tree could result in the pipeline

[5] Equipment (e.g., flange or valve leakage) is a greater source of leakage, however is not considered in this percentage as this is, by definition, applicable only to non-pipe components

[6] § 192.903 Definition

[7] PHMSA Gas Transmission performance Data, 2004-2020

providing a current path for electrical discharge, thereby causing coating damage and disruption to the CP system.

2.3 Third Party (Excavation) Damage

It is widely recognized as an industry leading practice for pipeline operators to keep a designated pipeline corridor (right-of-way) clear of obstructions and encroachments such as trees, buildings, and other physical barriers. This allows for regular visual inspections of the pipeline from both aerial and ground perspectives, as well as enabling access for pipe excavations when necessary. This industry leading practice is consistent with PG&E's Vegetation Management Standard and PHMSA's Pipeline Safety Stakeholder Communications website[8] which notes both as primary reasons for a clear right-of-way.

2.4 Pipeline Failure Modes

Six unique pipelines are represented in the database provided by PG&E with stresses at maximum allowable operating pressure (MAOP) ranging from 6% to 30% of the specified minimum yield strength (SMYS) of the pipeline steel. It is conventionally believed that pipelines operating at stresses less than approximately 20%-30% of the material yield strength do not experience sufficient stress to fail by rupture, therefore many practitioners only consider the potential for a failure by leak for these low stress lines. A 2013 research paper[9], however, presents both calculated scenarios and incidents where ruptures can and have occurred in pipelines operating at stresses less than 30% SMYS and as low as <10% SMYS. The paper states that low stress pipeline ruptures are "…not merely theoretical: such incidents have occurred and, though they are not frequent they are also not rare." The paper goes on to demonstrate that rupture at lower stresses generally occurs when a combination or interaction of threats exists, for example preferential corrosion coincident with a low-toughness electric resistance welded (ERW) seam. Another potential interaction is a brittle or flawed girth weld subjected to external loading such as through soil movement resulting from tree-root interactions. Most of the fabrication welds on these pipelines are considered susceptible to brittle fracture due to the material and workmanship standards during the time of construction and limited availability/application of inspection technologies during that period[10].

To summarize, the presence of trees on the pipeline right-of-way can, though interaction with industry recognized integrity threats, increase the potential for loss of containment failure (i.e., either leak or rupture of the pipeline). Removal of trees that have the potential to interact with the pipeline is a prudent leading industry activity, supported by data and PHMSA guidance, for management of the pipeline right-of-way.

[8] ROW Brief (https://primis.phmsa.dot.gov/comm/ROWBrief.htm)

[9] Rosenfeld, M, Fasset, R. (2013, February 13-14). *Study of pipelines that ruptured while operating at a hoop stress below 30% SMYS*. Pipeline Pigging and Integrity Management Conference, Houston, Texas, USA

[10] Workmanship standards have evolved over time with the improvement of technology for fabrication and inspection. Pipelines constructed in alignment with the regulations at the time of construction may have resident characteristics not present in modern pipelines.

3 Methodology

The City of Lafayette, in a letter, requested the development of a risk-related process to assess the 207 trees within the project scope, stipulating that the process should consider 17 factors. It was noted that the existing process used by PG&E for assessing risk related to trees in the pipeline ROW is documented within TD-4490P-03[11] and directly addresses 90% (15/17) of the factors[12] identified by the City in their proposed Tree Assessment Process; the remaining two factors are indirectly considered. Table 2 identifies factors included in the City's request aligned with the current PG&E process.

Table 2: Factors Identified by the City of Lafayette

Staff Report Letter Included Factor	Included in PG&E Risk Assessment Process	Data Field Included in CPSI (PG&E) Spreadsheet	Comment
Tree species	Partial	Yes	Not specifically included in TD-4490P-03, though at least partially considered w/ tree size at maturity
Tree size at full maturity	Yes	Yes	Above and below 17"DBH
Distance to the pipe	Yes	Yes	Edge of pipe to edge of tree
Depth of the pipeline	Yes	Yes	
Pipeline diameter	Yes	Yes	
Pipeline pressure (Percent SMYS)	Yes	Yes	
Pipeline age/installation year	Yes	Yes	
Pipeline coating	Yes	Yes	
Liquefaction potential	Yes	Yes	
External corrosion parameters	Yes	Yes	Coating type only
Weather exposure – lightning, wind, flooding	Yes	Yes	
Seismicity	Yes	Yes	"fault crossings" in PGE Data
Soil stability	Yes	Yes	"soil stability" in PGE Data
Girth weld age/**type** (i.e, acetylene weld)	Partial	Yes – age No – type	GW Type is not specifically included in TD-4490P-03, though the pre-1962 GW age factor is included in PG&E Data
Population density	Yes	Yes	Yes or no people in potential impact radius

[11] Pacific Gas and Electric Company, Utility Procedure: TD-4990P-03, Vegetation Encroachment Site-Specific Risk Analysis

[12] These "factors" are referred to in the City of Lafayette Staff Report1 as "criteria". They are referred to here as factors because there are no defined criteria for assessing these factors within the City of Lafayette Staff Report.

Damage prevention parameters	Yes	Yes	"Patrol/Monitoring method" and "AQ – Publicly recognizable ROW" in PGE Data
Emergency response parameters	Yes	Yes	"Site access potential" in PGE Data

The existing PG&E process was developed by considering field data collected at site locations on the PG&E right-of-way, relying on empirical observations of interactions between trees and pipelines. This procedure, documented in TD-4990P-03, is firmly grounded in research, driven by data, and extensively supported by technical documentation. As a result, Dynamic Risk recommended the continued use of TD-4490P-03 to the Tree Advisory Team in late 2021, rather than undertaking the development of a revised risk assessment process. TD-4990P-03 includes a screening process depicted in Figure 1.

It was identified by the Tree Advisory Team in 2021 that several of the 207 subject trees had already been removed and a number of the 207 trees were considered to be in poor health. Therefore, prior to applying any risk assessment criteria to the individual trees it was agreed by the Tree Advisory Team that the arborists would conduct a tree health assessment[13] on each tree.

Table 1 within TD-4490P-03 provides guidance that relatively small trees ($\leq$ 17-inch Diameter at Breast Height, or "DBH"), with less than 2-feet of distance from the mature tree to the pipe and with a 3-feet or less depth of cover, are not acceptable. For larger trees, greater than 17-inch DBH at maturity, no trees can exist within a 2-foot proximity to the pipeline even with up to 5-foot depth of cover. With adequate depth of cover, some trees within a 5-foot proximity to the pipe will meet the established criteria to be remain subject to monitoring. These criteria are consistent with reducing the potential for tree root interaction with the pipeline and applicable integrity threats.

[13] Tree health assessment based on Council of Tree and Landscape Appraisers. 2018. *Guide for Plant Appraisal 10th Edition.* International Society of Arboriculture. Champaign, IL.

Distance from Mature Tree to Pipe	Depth of Cover (DOC)			
	Less Than OR Equal to 3 ft.	Greater Than 3 ft AND Less Than 5 ft.	Equal to OR Greater Than 5 ft AND Less Than OR Equal to 10 ft.	Greater Than 10 ft AND Clear Walking Path Above the Pipeline.
DBH at Maturity of 17 Inches or Less				
Less than 2 ft	Eliminate Threat	Additional Analysis	Monitor Threat	
2 ft or More	Monitor Threat			
DBH at Maturity of More than 17 Inches				
Less than 2 ft	Eliminate Threat		Additional Analysis	Monitor Threat
2 to 5 ft	Additional Analysis		Monitor Threat	
More than 5 ft	Monitor Threat			

Figure 1: Table 1 of TD-4490P-03

The screening process (Figure 1) segments the tree populations into three categories:

- Eliminate Threat
- Additional Analysis
- Monitor Threat

The trees categorized for Additional Analysis are then further assessed per TD-4490-P03 using the "additional analysis spreadsheet". This spreadsheet is a tool that includes the evaluation of additional factors shown below. The criteria for establishing the level of the threat are defined within the model considering the following factors:

- Coating type
- Exposure to lightning
- Exposure to winds
- Slanting of the tree
- Proximity to water path bank
- Potential for soil instability
- Pipe depth
- Pipe diameter
- Proximity of tree to pipe
- Potential for girth weld vintage to interact with soil instability
- Pipeline marker visibility
- Feasibility of ROW inspection
- Emergency vehicle access

4 Analysis

The logic diagram depicted in Figure 2 illustrates the developed process for assessing the trees, outlining their progression through the TD-4490P-03 Screening and Additional Analysis.

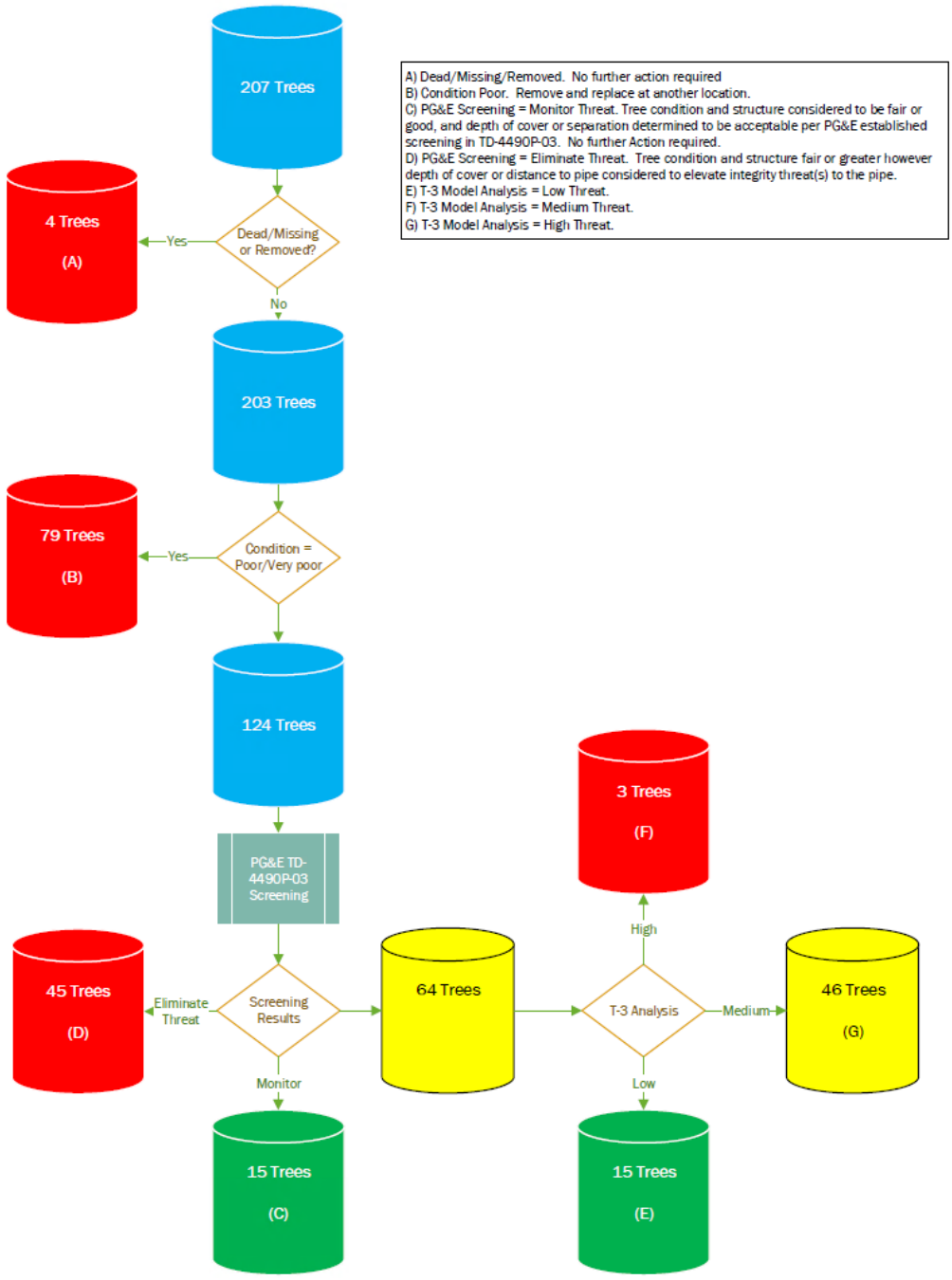

Figure 2: Logic Diagram - Tree Assessment Process

5 Results

Trees recommended for removal, based on the tree health assessment, if not already removed, are presented in Table 3. These are the trees in categories A and B in Figure 2 and represent the findings of the Arborists tree health study.

As a result of the screening process represented by Figure 1, trees were categorized as follows:

- C: Monitor (Leave in place), (Table 4) 15 Trees
- D: Eliminate Threat (Remove), (Table 5) 45 Trees
- Further Analysis

There were 64 trees remaining for additional analysis after the screening process. These trees were subjected to additional analysis per TD-4490-P03 and further categorized:

- F: High Threat: Remove and Eliminate Threat (Table 6)
    - It is noted that the three trees in this list are on pipelines with the relatively lowest depths of cover at 2 feet or less.
- E: Low Threat: Monitor (Leave in Place) 15 trees (Table 7)
- G: Medium Threat: Monitor (Leave in Place) 46 trees (Table 7).

All 64 trees were the same for the following factors, so they are not shown in Table 6 and Table 7.

- Exposure to lightning: trees fully protected from lightning
- Exposure to winds: trees not exposed to high winds
- Slanting of the tree: trees not slanted
- Proximity to water path bank: trees not near pipe on water path bank
- Feasibility of ROW inspection: foot/aerial patrol possible
- Emergency vehicle access: limited access to site with emergency vehicles

6 Conclusion

A total of 207 trees were identified as being within the scope of this project. The Arborists health assessment identified 83 of the 207 trees for removal based on poor health. Following the data-driven assessment, an additional 48 of the 207 trees are recommended for removal. In total, 131 of the 207 trees are recommended for removal. Meanwhile 76 of the 207 trees meet criteria to remain in place subject to ongoing monitoring to confirm that they do not pose an elevated threat to the integrity of the pipelines.

Appendix A City of Lafayette Tree Root Assessment Results

Table 3: Tree Health Assessment Results: Trees recommended for removal, Categories A & B

VEGPT NAME	Species	Tree Tag	Condition
ID003528	Maple, Bigleaf	681	Poor
ID003536	Oak, Coast Live	683	Poor
ID003556	Oak, Coast Live	688	Poor
ID003562	Oak, Coast Live		Removed
ID003889	Oak, Coast Live	658	Poor
ID003904	Oak, Coast Live	164	Poor
ID003912	Oak, Coast Live	165	Poor
ID003914	Oak, Coast Live	166	Poor
ID003926	Oak, Coast Live	169	Poor
ID003939	Oak, Coast Live	175	Poor
ID003954	Oak, Coast Live	177	Poor
ID003973	Oak, Coast Live		Poor
ID003976	Oak, Coast Live		Poor
ID003977	Oak, Coast Live	184	Poor
ID003987	Oak, Valley	186	Poor
ID004010	Oak, Coast Live	189	Poor
ID004019	Oak, Valley	192	Poor
ID004047	Oak, Coast Live	201	Poor
ID004049	Oak, Coast Live	201	Poor
ID004063	Oak, Coast Live	204	Poor
ID004071	Oak, Coast Live	205	Poor
ID004074	Oak, Coast Live	206	Very Poor
ID004094	Oak, Coast Live	210	Poor
ID004106	Oak, Valley	214	Poor
ID004140	Oak, Coast Live	220	Poor
ID004142	Oak, Coast Live	223	Poor
ID004146	Oak, Coast Live	225	Very Poor
ID004147	Oak, Coast Live	226	Poor
ID004156	Oak, Valley	229	Poor
ID004165	Oak, Valley	230	Poor
ID004166	Oak, Valley	231	Poor
ID004170	Oak, Valley	232	Poor
ID004171	Oak, Valley	233	Poor
ID004205	Buckeye		Dead
ID004206	Buckeye	235	Very Poor
ID004239	Bay laurel	241	Poor
ID004270	Oak, Valley		Very Poor

VEGPT NAME	Species	Tree Tag	Condition
ID004272	Oak, Valley		Poor
ID004395	Pine, Gray	8	Poor
ID004401	Pine, Gray	99	Poor
ID004405	Oak, Coast Live	97	Poor
ID004420	Oak, Valley	90	Poor
ID004427	Oak, Valley	362	Poor
ID004447	Oak, Coast Live	1000	Very Poor
ID004449	Bay laurel		Poor
ID004451	Oak, Coast Live		Poor
ID004454	Oak, Valley	999	Poor
ID004545	Oak, Coast Live	113	Removed
ID004672	Oak, Valley	121	Poor
ID004766	Oak, Valley		Poor
ID004833	Cherry		Poor
ID004837	Oak, Coast Live		Poor
ID004860	Olive	292	Very Poor
ID004865	Willow	296	Very Poor
ID004868	Willow	297	Dead
ID004878	Oak, Coast Live	298	Poor
ID004898	Pine		Poor
ID004934	Walnut	660	Poor
ID004936	Oak, Coast Live	661	Poor
ID004973	Oak, Coast Live	699	Poor
ID005032	Oak, Valley	680	Very Poor
ID005033	Oak, Valley	679	Very Poor
ID005041	Pine	667	Poor
ID005042	Pine	668	Poor
ID005057	Redwood	676	Very Poor
ID005069	Plum, Purple-Leaf		Dead
ID005070	Plum, Purple-Leaf		Poor
ID005071	Plum, Purple-Leaf		Poor
ID005073	Ailanthus		Poor
ID005087	Arbutus-Strawberry Tree	Removed	Poor
ID005187	Oak, Laurel		Poor
ID005193	Oak, Valley	665	Poor
ID005204	Oak, Valley	663	Poor
ID005363	Oak, Valley		Poor
ID005375	Oak, Valley		Poor
ID005486	Willow		Dead
ID005530	Walnut-black		Removed
ID005935	Cherry		Poor

VEGPT NAME	Species	Tree Tag	Condition
ID005945	Oak, Valley	271	Poor
ID005953	Oak, Coast Live	268	Poor
ID005964	Oak, Valley	245	Poor
ID005977	Pine, Italian Stone	287	Very Poor
ID005986	Birch		Poor

Table 4: Screening Process Results: Trees Meeting Conditions to be Monitored based on TD 4490P-03 Screening, Category C

VEGPT_NAME	Species	Tree Tag	Tree DBH	Mature DBH >17	Distance to Pipe (Ft) Current	Depth of Cover (ft)	TD-4490P-03 Screening
ID003560	Oak, Coast Live	689	11	N/A	6	2.83	Monitor Threat
ID003862[14]	Spruce	Removed	11	N/A		6.17	Monitor Threat
ID003863	Redwood	996	2	N/A	3	7.42	Monitor Threat
ID003890	Oak, Valley	650	15	N/A	7	4.92	Monitor Threat
ID003943	Oak, Coast Live	176	7	Yes	6	3.25	Monitor Threat
ID004099	Oak, Coast Live	212	9	Yes	7	3.83	Monitor Threat
ID004143	Oak, Coast Live	222	14	Yes	6	3.75	Monitor Threat
ID004195	Oak, Coast Live		1	Yes	4	5.00	Monitor Threat
ID004261	Buckeye	11	7	No	2	4.08	Monitor Threat
ID004448	Bay laurel	87	8	N/A	4	6.75	Monitor Threat
ID004831	Almond		42	Yes	8	5.50	Monitor Threat
ID004847	Oak, Coast Live	172	9	Yes	7	3.42	Monitor Threat
ID005195	Redwood	666	11	N/A	6	2.00	Monitor Threat
ID005885	Redwood	262	42	Yes	3	6.00	Monitor Threat
ID1082001	Oak, Silk		1	N/A	7	5.67	Monitor Threat

[14] The presence of this tree needs to be verified as it may have been removed.

Table 5 : Screening Process Results: Trees Meeting Conditions to be Eliminated based on TD 4490P-03 Screening, Category D

VEGPT_NAME	Species	Tree Tag	Tree DBH	Mature DBH >17	Distance to Pipe (Ft) Current	Depth of Cover (ft)	TD-4490P-03 Screening
ID003843[14]	Maple	Removed	8	N/A		4.75	Eliminate Threat
ID003867	Redwood	997	30	Yes	0	2.75	Eliminate Threat
ID003927	Oak, Coast Live		11	Yes	1	3.50	Eliminate Threat
ID003959	Oak, Coast Live	178	30	Yes	1	3.08	Eliminate Threat
ID003972	Oak, Coast Live	182	8	Yes	0	3.17	Eliminate Threat
ID003974	Oak, Coast Live		5	Yes	0	3.17	Eliminate Threat
ID003975	Oak, Coast Live	183	16	Yes	0	3.17	Eliminate Threat
ID003978	Oak, Coast Live	185	19	Yes	0	3.17	Eliminate Threat
ID003995	Oak, Coast Live	187	6	Yes	1	3.42	Eliminate Threat
ID004022	Oak, Coast Live	195	4	Yes	0	3.00	Eliminate Threat
ID004075	Oak, Coast Live	204	16	Yes	1	4.08	Eliminate Threat
ID004095	Oak, Coast Live	211	13	Yes	1	4.50	Eliminate Threat
ID004111	Oak, Coast Live	271	12	Yes	0	3.50	Eliminate Threat
ID004145	Oak, Coast Live	224	13	Yes	0	3.08	Eliminate Threat
ID004148	Oak, Coast Live	227	18	Yes	1	3.08	Eliminate Threat
ID004151	Oak, Coast Live	228	30	Yes	0	3.08	Eliminate Threat
ID004232	Oak, Coast Live	238	30	Yes	0	3.67	Eliminate Threat
ID004235	Oak, Coast Live	239	12	Yes	1	3.42	Eliminate Threat
ID004292	Maple, Red		1	N/A	1	3.50	Eliminate Threat
ID004293	Ginkgo		5	N/A	0	3.50	Eliminate Threat
ID004294	Maple		8	N/A	0	3.50	Eliminate Threat
ID004295	Ginkgo		4	N/A	0	3.50	Eliminate Threat
ID004397	Oak, Coast Live	100	30	Yes	1	3.42	Eliminate Threat
ID004403	Oak, Coast Live	98	4	N/A	0	3.42	Eliminate Threat
ID004493	Walnut-English	105	18	Yes	0	3.92	Eliminate Threat
ID004518	Oak, Coast Live	108	10	Yes	1	4.00	Eliminate Threat
ID004533	Deodore Cedar	692	8	N/A	1	3.33	Eliminate Threat
ID004543	Oak, Coast Live	112	9	Yes	1	3.42	Eliminate Threat
ID004646	Cottonwood	118	42	Yes		2.75	Eliminate Threat
ID004765	Oak, Coast Live		9	Yes	0	1.08	Eliminate Threat
ID004849	Oak, Coast Live	173	12	N/A	1	3.42	Eliminate Threat
ID004880	Oak, Coast Live	299	11	N/A	0	3.42	Eliminate Threat
ID004966	Oak, Coast Live	694	30	Yes	1	3.50	Eliminate Threat
ID004974	Oak, Coast Live	700	12	N/A	1	3.83	Eliminate Threat
ID005051	Redwood	677	15	N/A	0	3.83	Eliminate Threat
ID005188	Oak, Live	127	9	N/A	0	3.33	Eliminate Threat
ID005207	Pine	662	12	N/A	1	3.75	Eliminate Threat

VEGPT_NAME	Species	Tree Tag	Tree DBH	Mature DBH >17	Distance to Pipe (Ft) Current	Depth of Cover (ft)	TD-4490P-03 Screening
ID005378	Oak, Valley		12	Yes	1	4.00	Eliminate Threat
ID005533	Oak, Valley	140	42	Yes	1	4.58	Eliminate Threat
ID005874	Chinese Pistache	265	4	N/A	0	2.50	Eliminate Threat
ID005880	Birch	264	14	N/A	0	2.75	Eliminate Threat
ID005891[14]	Pine, Monterey	Removed	21	Yes		4.08	Eliminate Threat
ID005907	Redwood	290	30	Yes	0	3.25	Eliminate Threat
ID005908	Cedar	289	10	N/A	1	3.00	Eliminate Threat
ID005955	Oak, Coast Live		8	N/A	0	3.08	Eliminate Threat

Table 6 : TD-4490P-03 Additional Analysis Results: Trees for removal, Category F

VEGPT_NAME	Species	Tree Tag	T3 Model Risk Level
ID004669	Oak, Coast Live		High
ID004671	Oak, Coast Live	120	High
ID005196	Cedar	664	High

Table 7 : TD-4490-P03Additional Analysis Results: Trees for monitoring, Category E and G

VEGPT_NAME	Species	Tree Tag	T3 Model Risk Level
ID003892	Oak, Valley	300	Low
ID004041	Oak, Coast Live	197	Low
ID004042	Oak, Coast Live	198	Low
ID004396	Oak, Coast Live	7	Low
ID004410	Oak, Coast Live	91	Low
ID004433	Bay laurel		Low
ID004522	Oak, Valley	Dead	Low
ID004532	Deodore Cedar	691	Low
ID004548	Oak, Coast Live	116	Low
ID004909[14]	Pine, Monterey	Removed	Low
ID005331	Oak, Coast Live		Low
ID005356	Oak, Coast Live		Low
ID005914[14]	Pine, Monterey	Removed	Low
ID005925	Oak, Valley	276	Low
ID005952	Oak, Coast Live	266	Low
ID003551	Oak, Coast Live	687	Medium
ID003859	Alder	242	Medium
ID003918	Oak, Coast Live	168	Medium
ID003919	Oak, Coast Live	167	Medium
ID003936	Oak, California Black	174	Medium
ID003968	Oak, Coast Live	179	Medium

VEGPT_NAME	Species	Tree Tag	T3 Model Risk Level
ID003969	Oak, Coast Live	181	Medium
ID003970	Oak, Coast Live	180	Medium
ID003990	Oak, Coast Live		Medium
ID004016	Oak, Coast Live	191	Medium
ID004020	Bay laurel	193	Medium
ID004025	Oak, Coast Live	196	Medium
ID004043	Oak, Coast Live	199	Medium
ID004052	Oak, Coast Live		Medium
ID004059	Oak, Coast Live	203	Medium
ID004077	Oak, Coast Live	208	Medium
ID004085	Oak, Coast Live	209	Medium
ID004098	Oak, Coast Live	213	Medium
ID004110	Oak, Coast Live	216	Medium
ID004119	Oak, Coast Live	218	Medium
ID004135	Oak, Coast Live	219	Medium
ID004141	Oak, Coast Live	221	Medium
ID004227	Oak, Coast Live	236	Medium
ID004233	Oak, Coast Live	237	Medium
ID004237	Oak, Coast Live	67	Medium
ID004472	Oak, Coast Live		Medium
ID004535	Oak, Coast Live	693	Medium
ID004830	Plum, Purple-Leaf		Medium
ID004832	Almond		Medium
ID004846	Oak, Coast Live		Medium
ID004856	Redwood	291	Medium
ID004861	Oak, Coast Live		Medium
ID004863	Oak, Coast Live	294	Medium
ID004900[14]	Plum, Purple-Leaf	Removed	Medium
ID004908[14]	Elm	Removed	Medium
ID004969	Oak, Coast Live	698	Medium
ID005049	Redwood		Medium
ID005055	Redwood	675	Medium
ID005838	Oak, Coast Live	277	Medium
ID005886	Redwood	261	Medium
ID005927	Oak, Coast Live	275	Medium
ID005946	Oak, Valley	269	Medium
ID005965	Oak, Coast Live	244	Medium
ID005976	Oak, Coast Live	288	Medium
ID005979	Oak, Coast Live	286	Medium
ID005980	Oak, Coast Live	285	Medium