Town of Los Gatos

Initial Study and Mitigated Negative Declaration

15215 Shannon Road
Planned Development Application PD-15-001
Mitigated Negative Declaration ND-15-001

August 2016

Prepared for:
Town of Los Gatos
Community Development Department
110 E. Main Street
Los Gatos, CA 95031
January 2016

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Mitigated Negative Declaration

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Project Applicant

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Project Location

The project site is located in unincorporated Santa Clara County contiguous to the Los Gatos town limit. The 13-acre site (Assessor's Parcel Number 537-25-002) is located north of Shannon Road, generally east of Shady Lane as well as between the Shannon Road intersections with Suview Drive to the west and Sky Lane to the east.

Name of Project

15215 Shannon Road Planned Development Application PD-15-001

Project Description

The project site is located in unincorporated Santa Clara County contiguous to the Los Gatos town limit. The 13-acre site (Assessor's Parcel Number 537-25-002) is located north of Shannon Road, generally east of Shady Lane as well as between the Shannon Road intersections with Suview Drive to the west and Sky Lane to the east. The project site is currently developed with a single-family residence, guest cottage, pool and deck, tennis court, five sheds (one includes a horse run), stables, horse arena, breaking ring, and paved drive.

The project applicant is requesting approval of Planned Development to: (1) annex the 13-acre property into the Town of Los Gatos and West Valley Sanitation District; (2) rezone from HR-5 (Hillside Residential, 5-acre minimum lot size) (pre-zoned) to HR-2½:PD (Hillside Residential, 2.5-acre minimum lot size with Planned Development overlay) for subdivision of one lot into five lots; (3) construct four new single-family homes; and (4) remove large protected trees. After subdivision, each of the five lots would be 2.59 acres.

The following requested exceptions, as allowed by the Hillside Development Standards and Guidelines (HDS&G), would be required to implement the proposed PD:

- Development Outside Least Restricted Development Area (LRDA): A portion of the proposed private street would extend outside the LRDA to provide site access to the proposed building site.
- Grading (Cut and Fill Depths). An area of 4,500 square feet of the proposed private street (16% of the total private street area) would require cuts greater than four feet in depth, while an area of 3,770 square feet (11% of the total private street area) would require grading fills that exceed three feet in depth.
- Development on Ridgelines. Building sites would be located on the ridgeline.
- Road Grades. Sections of the proposed private road would have grades exceeding 15%; two sections (that are 250 feet in length) would have grades of up to 20%.
- Retaining Walls. Some retaining walls would exceed the five-foot height limit and 50-foot length limit.

Findings and Reasons

The Initial Study identified potentially significant effects on the environment. However, the proposed project has been mitigated (see Mitigation Measures below which avoid or mitigate the effects) to a point where the proposed project will not have the potential to significantly degrade the environment; will have no significant impact on long-term environmental goals; will have no significant cumulative effect upon the environment; and will not cause substantial adverse effects on human beings, either directly or indirectly.

The following reasons will support these findings:

1. Identified adverse impacts are proposed to be mitigated through implementation of mitigation measures incorporated herein.
2. The proposed project is consistent with the adopted goals and policies of the Los Gatos General Plan and the Los Gatos Municipal Code.
3. Town staff independently reviewed the Initial Study, and this Mitigated Negative Declaration reflects the independent judgment of the Town of Los Gatos.

Mitigation Measures

Mitigation Measure AIR-1: BAAQMD-Recommended Basic Construction Mitigation Measures

To limit the project's construction-related dust and criteria pollutant emissions, the following the Bay Area Air Quality Management District (BAAQMD)-recommended Basic Construction Mitigation Measures shall be included in the project's grading plan, building plans, and contract specifications:

a. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day. Recycled water should be used wherever feasible.

b. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
c. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
d. All vehicle speeds on unpaved roads shall be limited to 15 mph.
e. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible.
f. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to five minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.
g. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.
h. Post a publicly visible sign with the telephone number and person to contact at the Town regarding dust complaints. This person shall respond and take corrective action within 48 hours. The BAAQMD's phone number shall also be visible to ensure compliance with applicable regulations.

Mitigation Measure BIO-1: Special-status and Migratory Bird Species.

The following avoidance measures shall be required to avoid the project's potential effects on Cooper's hawk, and other special-status and migratory bird species.

a. *Raptor Nests.* Prior to the removal or significant pruning of any trees, they shall be inspected by a qualified biologist for the presence of raptor nests. This is required regardless of the season. If a suspected raptor nest is discovered, the California Department of Fish and Wildlife (CDFW) shall be notified. Pursuant to California Fish and Game Code (CFGC) Section 3503.5, raptor nests, whether or not they are occupied, may not be removed until approval is granted by the CDFW.

b. *Tree Work Outside of Breeding Season*. If clearing and grubbing and tree removal or pruning are to be conducted outside of the breeding season (i.e., September 1 through January 31), no preconstruction surveys for nesting migratory birds is necessary.

c. *Tree Work During Breeding Season*. If clearing and grubbing and tree removal or pruning are to be conducted during the breeding season (i.e., February 1 through August 31), a preconstruction nesting bird survey shall be conducted. The survey shall be performed by a qualified biologist no more than two weeks prior to the initiation of work. Preconstruction surveys should include all trees, large shrubs, or other areas of potential nesting habitat within the construction footprint or within 250 feet of the footprint. If no nesting or breeding activity is observed, work may proceed without restrictions. To the extent allowed by access, all active nests

identified within 76 m (250 feet) for raptors and 15 m (50 feet) for passerines shall be mapped.

d. For any active nests detected near the construction limits (76 m [250 feet] for raptors and 15 m [50 feet] for passerines), the qualified biologist shall make a determination as to whether or not construction activities are likely to disrupt reproductive behavior. If it is determined that construction is unlikely to disrupt breeding behavior, then construction may proceed. If it is determined that construction may disrupt breeding, then a suitable construction-free buffer should be established around all active nests where disruption of breeding may occur. The precise dimension of the buffer (up to 250 ft) would be determined at that time and may vary for each nest depending on location, species, topography, lines of site between the work area and the nest, physical barriers, and the ambient level of human activity. The buffer areas should be enclosed with temporary fencing, and construction equipment and workers should not enter the enclosed setback areas. Buffers should remain in place for the duration of the breeding season or until it has been confirmed by a qualified biologist that all chicks have fledged and are independent of their parents.

e. If maintenance of a no-construction buffer zone is not feasible, the qualified biologist shall monitor the nest(s) to document breeding and rearing behavior of the adult birds. If it is determined that construction activities are likely to cause nest abandonment, work shall cease immediately and the CDFW and/or the United States Fish and Wildlife Service (USFWS) Division of Migratory Bird Management shall be contacted for guidance. Work may not resume until an agreement has been reached with the authorities specifying the conditions under which work may proceed.

Mitigation Measure BIO-2: Special-status Bats

The following avoidance measures shall be required to avoid the project's potential effects on hoary bat or other special-status bat species.

a. A preconstruction survey shall be conducted by a qualified biologist to identify suitable bat roosting sites. If no evidence of roosting is detected, no further avoidance or minimization measures are necessary.

b. Any trees determined to support or potentially support maternal roosting sites may only be removed or demolished under guidance and recommendations of the bat biologist to avoid and minimize impacts and comply with the CDFG. Passive exclusion of roosting bats would be required and this may only be performed during the non-breeding season (i.e., between September 15 and March 1).

c. Any trees determined to provide suitable day or night roosting sites shall be identified and marked on site plans. Such roosting sites include snags, rotten stumps, and decadent trees with broken limbs, exfoliating bark, cavities, openings leading to interior portions of any structures. If no suitable roost sites or evidence of bat roosting are identified, impact minimization measures are not warranted. If

suitable roosting sites or evidence of bat roosting are identified, the following measures shall be conducted:

i. A qualified biologist shall survey suitable roost sites immediately prior to the removal or significant pruning of any of the larger trees, or demolition or significant renovation of any structures.

ii. If the qualified biologist identifies suitable day or night roost sites or evidence of bat occupation, the following steps shall be followed to discourage use of the sites by bats and to ensure that any bats present are able to safely relocate.

For trees:

- Tree limbs smaller than 7.6 cm (3 in) in diameter shall be removed and any loose bark shall be peeled away.
- Any competing limbs that provide shelter around the potential roost site shall be removed to create as open of an area as possible.
- The tree shall then be left alone to allow any bats using the tree/snag to find another roost during their nocturnal activity period.
- The qualified biologist shall survey the trees a second time 48 hours after trimming.
- If no bats are present, work may proceed.
- If bats remain on the site, additional measures would be prescribed by the biologist.

d. Pre-demolition bat surveys should be conducted to determine if bats are present in structures onsite. If no bats are observed to be roosting in structures identified as potentially suitable habitat, then no further action is required, and dismantling of the structures can proceed. However, if bats are found to be roosting in structures on the site, the project proponents shall exclude bats prior to dismantling any structures to ensure no harm or take would occur to any bats as a result of demolition activities. Dismantling of structures should occur after September 15 and before March 1 to avoid interfering with an active nursery. If a non-breeding bat colony is found in the structures, the individuals should be safely evicted under the direction of a qualified bat biologist through a “partial dismantle” process, whereby the roosting area is opened to allow airflow through and sunlight into the structure, making it unsuitable habitat and undesirable for the bats to return to the site. Full dismantling should then follow no later than the following day (i.e., there should be no less than one night between initial disturbance for airflow and the demolition). This action should allow bats to leave during the night, thus increasing their chances of finding new roosts with a minimum of potential predation during daylight hours.

Mitigation Measure BIO-3: San Francisco Dusky-footed Woodrat (SFDW)

To ensure no take of SFDW occurs, the following protective measures shall be followed.

a. A pre-construction wildlife survey shall be performed prior to any land clearing activities within the identified construction area to search for woodrat nests. If no nests are detected, no further avoidance measures are warranted.

b. If a woodrat nest is detected, it shall be mapped in relation to the proposed limits of work. If the nest can be avoided, it shall be isolated from the work zone by installation of wildlife exclusion fencing.

c. If a woodrat nest is in the work zone and it cannot be avoided, site clearing shall be performed during the non-breeding season (e.g., September 1 through November 30). During the non-breeding season, the nest shall be disassembled by hand and the nest materials (e.g., sticks) removed and disposed of off-site. Any adult animals will be passively relocated into the adjacent woodland habitat. This work shall be supervised by a qualified biologist. Upon completion, the biologist shall notify CDFW of the translocation work.

d. If site clearing must proceed during the breeding season, it will be necessary to determine whether or not the nest is currently occupied. This may be done by direct observation over the course of at least two evenings no more than 48 hours prior to nest disassembly. Direct observation may consist of installation of wildlife cameras at the nest or by a biologist on the ground. If no animals are observed, the nest may be disassembled by hand. If, during the process of disassembling the nest, live animals are encountered, nest materials shall be replaced on top of the nest and the effort abandoned. Nests may not be disassembled if young woodrats are present. Construction must then be postponed until the end of the breeding season.

Mitigation Measure BIO-4: Tree Replacement and Protection

Prior to the removal of any trees, a tree removal permit shall be obtained from the Town of Los Gatos, and all of the conditions of the permit shall be followed during tree removal. Tree replacement plantings shall be in conformance with Table 3-1 (Tree Canopy-Replacement Standard) of the Town's Tree Protection Ordinance and Appendix A of the Hillside Development Standards and Guidelines.

The project applicant shall be required to implement recommendations made by the Town's consulting arborist, Deborah Ellis, MS, in the report dated June 15, 2015 as well as any subsequent updates. These recommendations are included in Attachment B.

Mitigation Measure CUL-1: Archaeological Resources

Construction personnel involved with earthmoving shall be alerted to the potential for the discovery of prehistoric materials. Prehistoric archaeological materials might include obsidian and chert flaked-stone tools (e.g., projectile points, knives, scrapers) or toolmaking debris; culturally darkened soil ("midden") containing heat-affected rocks, artifacts, or shellfish remains; and stone milling equipment (e.g., mortars, pestles, handstones, or milling slabs); and battered stone tools, such as hammerstones and pitted stones. Historic-period materials might include stone, concrete, or adobe footings and walls; filled wells or privies; and deposits of metal, glass, and/or ceramic refuse.

If prehistoric or historic-period archaeological resources are encountered, all construction activities within 50 feet shall halt and the Community Development Director shall be notified. A Secretary of the Interior-qualified archaeologist shall inspect the findings within 24 hours of discovery. If it is determined that the project could damage a historical resource or a unique archaeological resource (as defined pursuant to the CEQA *Guidelines*), mitigation shall be implemented in accordance with Public Resources Code (PRC) Section 21083.2 and Section 15126.4 of the CEQA *Guidelines*, with a preference for preservation in place. Consistent with Section 15126.4(b)(3), this may be accomplished through planning construction to avoid the resource; incorporating the resource within open space; capping and covering the resource; or deeding the site into a permanent conservation easement. If avoidance is not feasible, a qualified archaeologist shall prepare and implement a detailed treatment plan in consultation with Community Development Department. Treatment of unique archaeological resources shall follow the applicable requirements of PRC Section 21083.2. Treatment for most resources shall consist of (but would not be not limited to) sample excavation, artifact collection, site documentation, and historical research, with the aim to target the recovery of important scientific data contained in the portion(s) of the significant resource to be impacted by the project. The treatment plan shall include provisions for analysis of data in a regional context, reporting of results within a timely manner, curation of artifacts and data at an approved facility, and dissemination of reports to local and state repositories, libraries, and interested professionals.

Mitigation Measure CUL-2: Paleontological Resources

Prior to the commencement of construction activities, the project applicant or its successor(s) in interest shall provide for a qualified paleontologist to provide construction personnel with training on procedures to be followed in the event that a fossil site or fossil occurrence is encountered during construction. The training shall include instructions on identification techniques and how to further avoid disturbing the fossils until a paleontological specialist can assess the site. An informational package shall be provided for construction personnel not present at the meeting.

In the event that a paleontological resource (fossilized invertebrate, vertebrate, plant or micro-fossil) is found during construction, excavation within 50 feet of the find shall be temporarily halted or diverted until the discovery is evaluated. Upon discovery, the Community Development Director shall be notified immediately and a qualified paleontologist shall be retained to document and assess the discovery in accordance with Society of Vertebrate Paleontology's 2010 Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources, and recommend procedures to be followed before construction is allowed to resume at the location of the find. If the Community Development Director determines that avoidance is not feasible in light of project design, logistics, and costs, the paleontologist will prepare a recommended excavation plan, subject to review and approval by the Community Development Director, for mitigating the project's impact on this resource, including preparation, identification, cataloging, and curation of any salvaged specimens.

Mitigation Measure CUL-3: Human Remains

In the event of discovery or recognition of any human remains during construction activities, such activities within 50 feet of the find would cease until the San Mateo County Coroner has been contacted to determine that no investigation of the cause of death is required. The Native American Heritage Commission (NAHC) shall be contacted within 24 hours if it is determined that the remains are Native American. The NAHC would then identify the person or persons it believes to be the most likely descendant from the deceased Native American, who in turn would make recommendations to the Town of Los Gatos for the appropriate means of treating the human remains and any grave goods.

Mitigation Measure GEO-1: Geotechnical Investigation

For the proposed roadway and each proposed residential unit, the project applicant(s) shall consult with a registered geotechnical engineer to prepare a design-level geotechnical investigation that incorporates the recommendations in the *Geologic and Geotechnical Feasibility Study: Proposed Five-Lot Subdivision, Sahadi Property* (UPP Geotechnology, 2015). The design-level geotechnical report shall address, but not be limited to, site preparation and grading, building foundations, and CBC seismic design parameters. A design-level geotechnical report shall be prepared and submitted in conjunction with Building Permit application(s) and reviewed and approved by the Town of Los Gatos. Recommendations from the design-level geotechnical report shall be incorporated into the final project design and construction documents.

Mitigation Measure HAZ-1: Fire Safety Plan During Construction

The contractors for the proposed project and future residential development shall prepare and implement fire safety plans for construction operations to prevent and respond to fire. The plan shall state that construction equipment be equipped with fire prevention devices (e.g., spark arrestors) pursuant to Public Resources Code 4442. Water and firefighting tools (e.g. shovels, axes, fire extinguishers) shall be maintained on site during construction activities. The plan shall be reviewed and approved by the Town of Los Gatos prior to issuance of demolition, grading, or building permits.

Mitigation Measure NOI-1: Construction Specifications to Reduce Noise

The project applicant and its successors shall ensure that the following practices are incorporated into the construction specification documents to be implemented by the project contractor:

- Provide enclosures and mufflers for stationary equipment, shrouding or shielding for impact tools, and barriers around particularly noisy operations, such as grading or use of concrete saws within 50 feet of an occupied sensitive land use.
- Use construction equipment with lower (less than 70 dB) noise emission ratings whenever possible, particularly air compressors and generators.
- Do not use equipment on which sound-control devices provided by the manufacturer have been altered to reduce noise control.

- Locate stationary equipment, material stockpiles, and vehicle staging areas as far as practicable from sensitive receptors.
- Prohibit unnecessary idling of internal combustion engines.
- Implement noise attenuation measures to the extent feasible (i.e., such that they do not impede efficient operation of equipment or dramatically slow production rates), which may include, but are not limited to, noise barriers or noise blankets. The placement of such attenuation measures shall be reviewed and approved by the Los Gatos Building Division prior to issuance of development permit for construction activities.

Mitigation Measure TRANS-1: Traffic Control Plan

The project applicant shall work with the Engineering Division of the Town of Los Gatos's Parks and Public Works Department to devise a traffic control plan for incorporation into the construction bid documents (specifications) to ensure safe and efficient traffic flow during periods when soil is hauled off the project site. The plan shall include, but not be limited to, the following measures:

- Hauling and delivery activities and designated truck routes shall be strategically selected, timed and coordinated to minimize traffic disruption to schools, residents, businesses, special events, and other projects in the area. The schools located on the haul route shall be contacted to help with the coordination of the trucking operation to minimize traffic disruption.
- Flag persons shall be placed at locations as necessary. All flag persons shall have the capability of communicating with each other to coordinate the operation.
- Prior to construction, advance notification of all affected residents and emergency services shall be made regarding one-way operation, specifying dates and hours of operation.
- Hauling of soil on or off-site shall not occur during the morning or evening peak periods (between 7:00 a.m. and 9:00 a.m. and between 4:00 p.m. and 6:00 p.m.).

Initial Study

Background & Project Description

Project Title

15215 Shannon Road Planned Development Application PD-15-001

Lead Agency Name and Address

Town of Los Gatos
110 E. Main Street
Los Gatos, CA 95030

Contact Person and Phone Number

Jennifer Armer, Associate Planner
Town of Los Gatos
Community Development Department
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The project site is currently developed with a single-family residence, guest cottage (without kitchen), pool and deck, tennis court, five sheds (one includes a horse run), stables, horse arena, breaking ring, and paved drive.

Project Applicant's Name and Address

Fred N. Sahadi
800 Pollard Road, C-36
Los Gatos, CA 95032

General Plan Designation

- Hillside Residential, 0- 1 dwelling units per acre (du/acre)
- Hillside Specific Plan, Blossom Hill Sub-Area (Sub-Area 1)

Zoning

HR-5 (Hillside Residential, 5-acre minimum lot size) (pre-zoned)

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The project applicant is requesting approval of Planned Development to:

1. Annex the 13-acre property into the Town of Los Gatos and concurrently into the West Valley Sanitation District;
2. Rezone from HR-5 (Hillside Residential, 5-acre minimum lot size) (pre-zoned) to HR-2½:PD (Hillside Residential, 2.5-acre minimum lot size with Planned Development overlay) for subdivision of one lot into five lots;
3. Construct four new single-family homes; and
4. Remove large protected trees.

After the proposed subdivision, each of the five lots would be 2.59 acres. Please see Figure 3, *Conceptual Site Plan* showing the conceptual development of the site. The proposed house pads are shown for reference only and will be subject to a separate Architecture and Site (A&S) review process when individual building plans are submitted to the Town.

As shown in Figure 3, the five lots created by the project would be accessed through the extension of Santella Drive. This existing public street extends from Shady Lane in the west and terminates on The Highlands property, which is located northwest of the project site. The project applicant proposes to extend Santella Drive as a public street, for a distance of approximately 200 feet, from its existing terminus to the Highlands property boundary. From the Highlands property boundary, the project applicant would then construct a 20-foot wide private shared-access drive via an existing 40-foot wide access easement that traverses the Vista Monterey property to the north to the project site's northern boundary. From the project site's northern boundary, this private shared access drive and cul-de-sac would extend onto the project site, and terminate with a turnaround bulb near the southeast corner of the site. This bulb would connect with the site's existing private driveway. The proposed private shared access drive and cul-de-sac would be 20 feet wide (within a 30-foot wide roadway and utility easement) and would not include on-street parking. The existing private driveway that extends to Shannon Road (via a private, 20-foot wide access easement) would be retained as a secondary access.

The project includes grading approximately 1,800 cubic yards of cut and 1,300 cubic yards of fill material for construction of the proposed roadway. Approximately 500 cubic yards of soil

would be required to be exported offsite to a legal disposal site. Please see Figure 4, *Conceptual Private Street Grading Plan*. Construction of the road includes the retaining walls along the most of the length of the roadway. Retaining wall heights vary from 0 to six feet depending on the section of the wall. Only grading for the roadway is proposed at this time. Grading for the future individual home sites will be evaluated as part of the A&S review process when those plans are submitted to the Town.

The proposed project would result in the creation of five residential lots, private shared access drive, and approximately 200 feet of public street (Santella Drive extension). No common areas are proposed, but a private common area easement (PCAE) covering approximately 2 acres is proposed for the existing horse arena. Various easements are also proposed to allow for emergency vehicle access on the private shared access drive and cul-de-sac, a public trail, water service, and private sanitary sewer service. The easements are shown in Figure 5, *Proposed Easements*.

All existing horse facilities and other structures would be retained except for the following: the existing pool and deck associated with the existing single-family home, tennis court, breaking ring; and a small structure next to the stable. Some of the facilities/structures to be retained would be located on various lots and extend over lot lines.

Water service, provided by the San Jose Water Company, would be conveyed to the site via a water main, which would extend from the existing water tank offsite immediately to the north and connect to project lots via the proposed shared access drive and existing driveway. The proposed water lines are shown in Figure 6, *Conceptual Water Plan*. The existing water line on the property would be abandoned in place.

Wastewater service at the project site would be provided by the West Valley Sanitation District. Gravity sewer laterals would connect the five proposed residences to a gravity sewer main in the private roadway onsite. Wastewater would flow to the northwest corner of the project site, where it would be pumped via a force main through an existing offsite sewer easement to a proposed sewer main within Santella Drive. Wastewater would then flow to the existing sanitary sewer in Shady Lane. The proposed sanitary sewer system is shown in Figure 7, *Conceptual Sanitary Sewer Plan*.

Future development of four homes on four of the newly-created lots would be subject to Architecture and Site (A&S) review and approval. During the A&S review process, site-specific land use, aesthetic, and tree impacts would be evaluated by the Town (including the project's consistency with the Hillside Development Standards and Guidelines). This report evaluates the impacts of the proposed new roadway, infrastructure, and development of four additional lots. Offsite improvements include construction of the access road, and connections to existing water and sewer mains. All offsite improvements are proposed within existing roadway and utility easements.

Proposed building sites are conceptual in nature and intended to fall within the Least Restrictive Development Areas (LRDA) and conform to requirements of the Hillside

Development Standards & Guidelines (HDS&G). However, the following requested exceptions (as allowed by the HDS&G) would be required to implement the proposed PD:

- Development Outside LRDA: A portion of the proposed private street would extend outside the LRDA to provide site access.
- Grading (Cut and Fill Depths). An area of 4,500 square feet of the proposed private street (16% of the total private street area) would require cuts greater than four feet in depth, while an area of 3,770 square feet (11% of the total private street area) would require grading fills that exceed three feet in depth.
- Development on Ridgelines. Building sites would be located on the ridgeline.
- Road Grades. Sections of the proposed private would have grades exceeding 15%; two sections (that are 250 feet in length) would have grades of up to 20%.
- Retaining Walls. Some retaining walls would exceed the five-foot height limit and 50-foot length limit.

Other Public Agencies Whose Approval Is Required

The project would also require approval from the Santa Clara County Fire Department, West Valley Sanitation District, and San José Water Company. Annexation to the Town of Los Gatos and West Valley Sanitation District would require approval from the Local Agency Formation Commission (LAFCO).

Environmental Setting

Project Site and Existing Facilities

The project site is currently developed with a single-family residence, guest cottage (without kitchen), pool and deck, tennis court, five sheds (one includes a horse run), stables, horse arena, breaking ring, and paved drive.

Surrounding Land Uses and Setting

The 13-acre project site is bounded by single-family residences to the west and southwest, an undeveloped parcel to the north, and open space (resource conservation) lands to the northeast, east, and southeast. The project site is accessed by a private drive via an easement from Shannon Road to the south. The site contains one single-family residence, guest cottage, pool and deck, tennis court, five sheds (one includes a horse run), stables, horse arena, breaking ring, and paved drive.

The project site and the contiguous parcel to the east of the site are located in unincorporated Santa Clara County. All remaining contiguous parcels are located within the Town of Los Gatos. The approximately 36-acre parcel to the north is currently vacant, but designated as Hillside Residential (0-1 unit/acre) in the Los Gatos General Plan and zoned as HR-2½ (2½ acre minimum lot size). The Highlands of Los Gatos development, also zoned as HR-2½, has 19 lots ranging between 1 and 4 acres in size on 66.28 acres, and it is located to the west, contiguous to the 36-acre parcel to the north. There are two parcels contiguous to the project site's western

boundary, each developed with a single-family residence: the 0.94-acre 15401 Shannon Road, and the 1.0-acre parcel 15403 Shannon Road, both of which are zoned as HR-2½. Another single-family residence is located on a 6.0-acre parcel zoned as HR-2½ adjacent to the site's southwestern project boundary (15282 Shannon Road).

The parcels located contiguous to the site's southeastern boundary (15291 Shannon Road) and northeastern boundary (no address) are 14.62 acres and 7.49 acres, respectively; they are both undeveloped and zoned as Resource Conservation. The parcel contiguous to the eastern project boundary is 22.8 acres and is undeveloped (pre-zoned Resource Conservation). This last parcel surrounds an existing residence that is located on a 1.1-acre parcel at 15025 Sky Lane. This residence is located approximately 550 feet east of the project site's eastern boundary.

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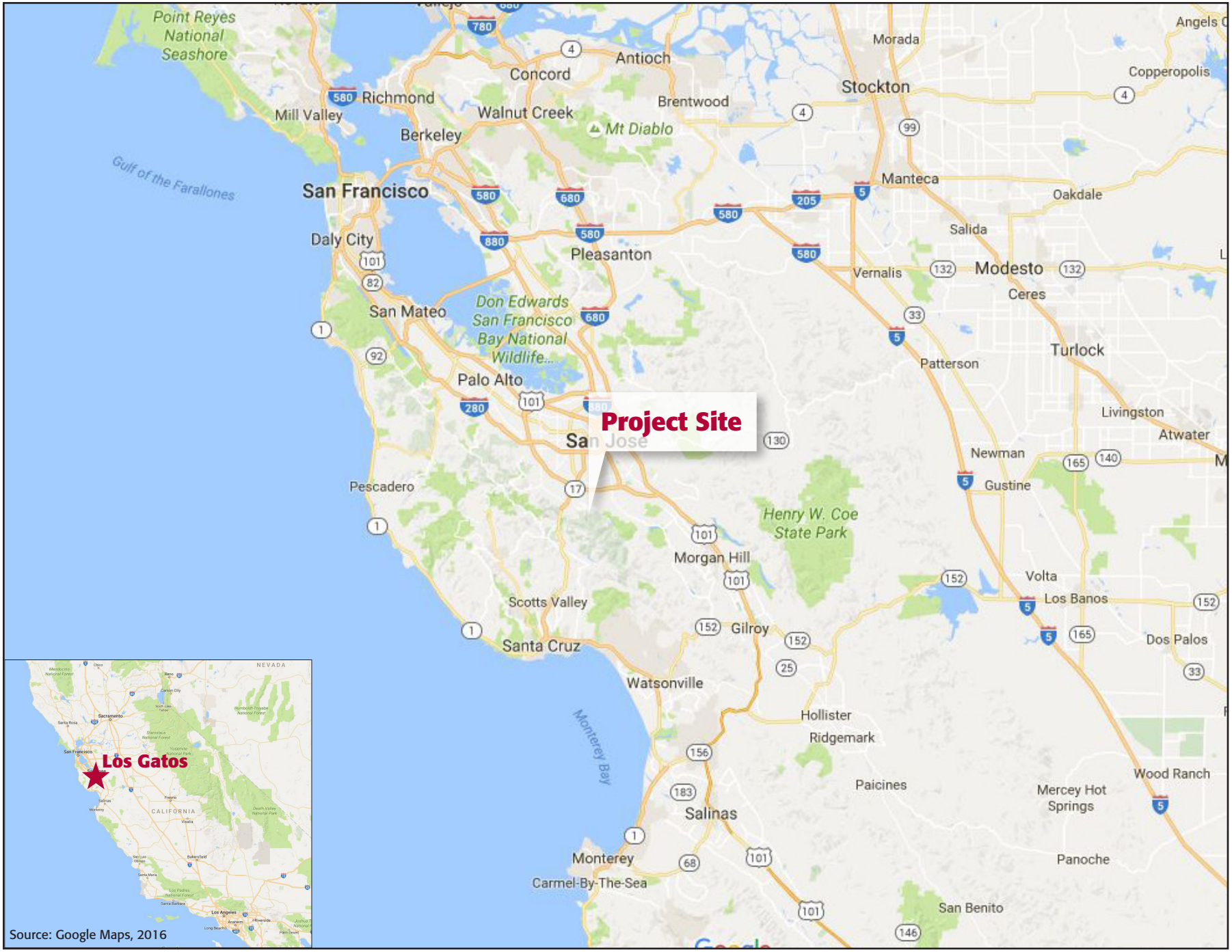


FIGURE 1: Regional Map
Shannon Road
Town of Los Gatos

Not to scale

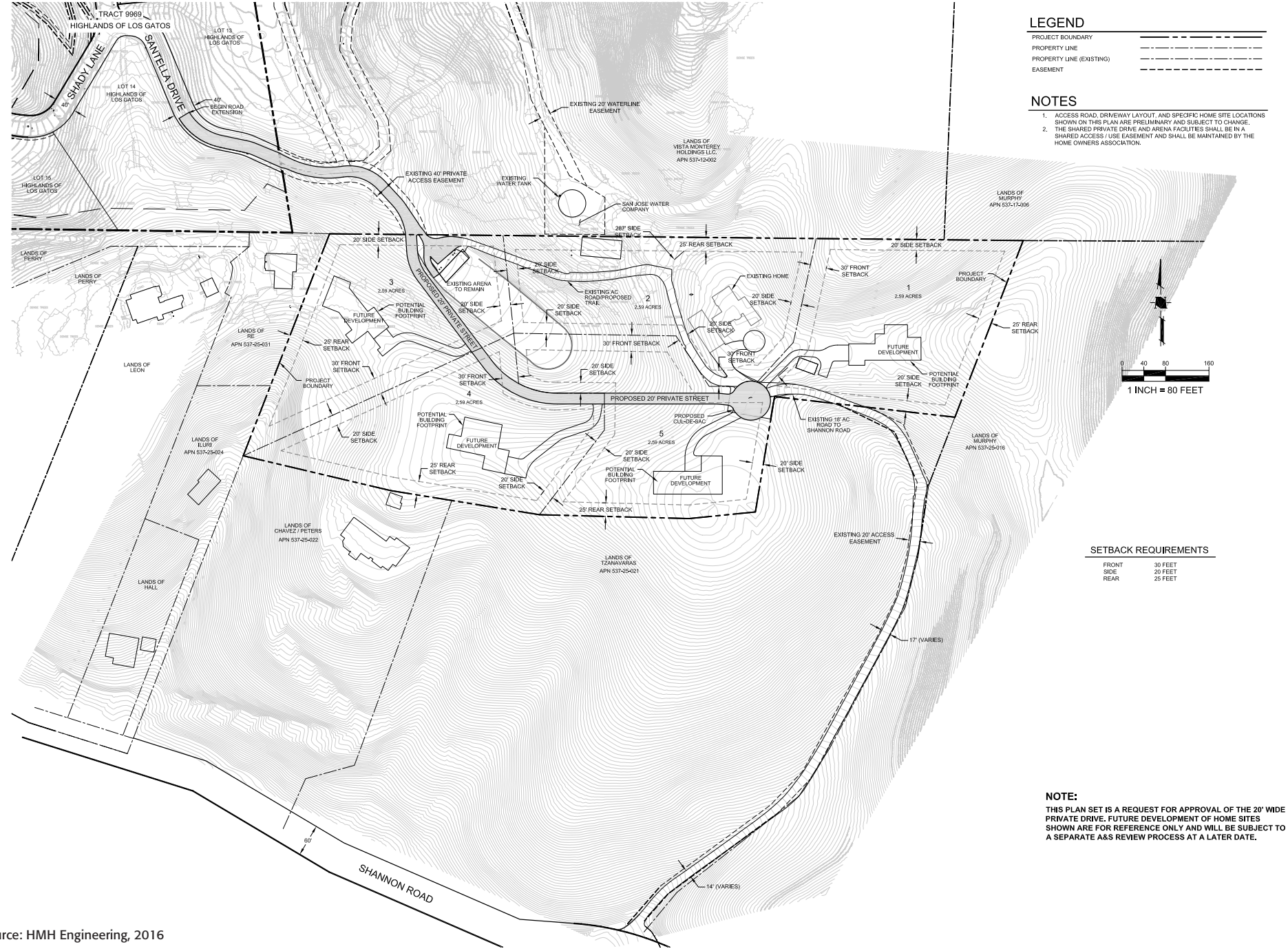
Kimley»Horn

Source: Google Earth, 2016

FIGURE 2: Vicinity Map
Shannon Road
Town of Los Gatos

Not to scale

Kimley»Horn

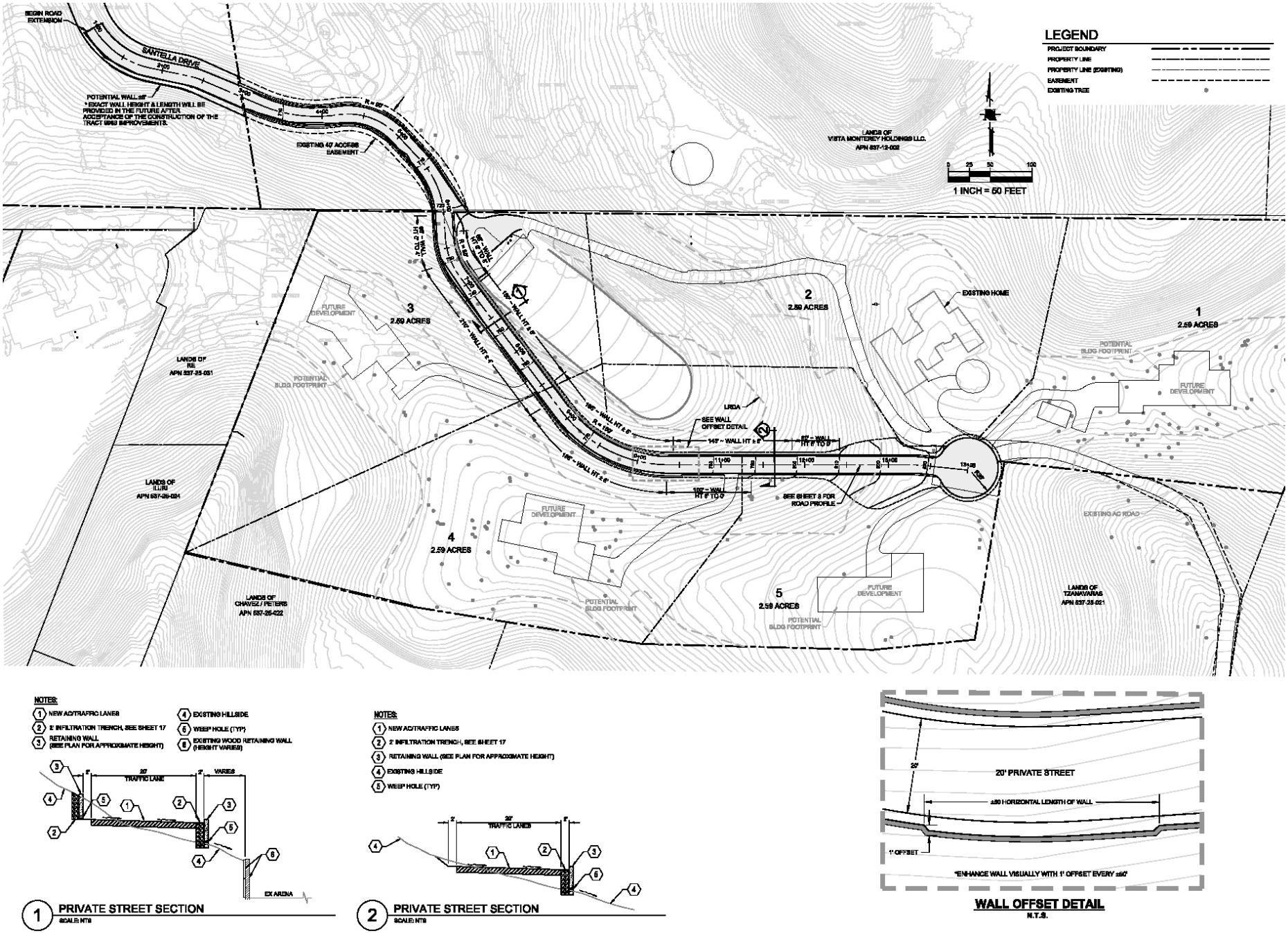


Source: HMH Engineering, 2016

FIGURE 3: Site Plan
Shannon Road
Town of Los Gatos

Not to scale

Kimley»Horn

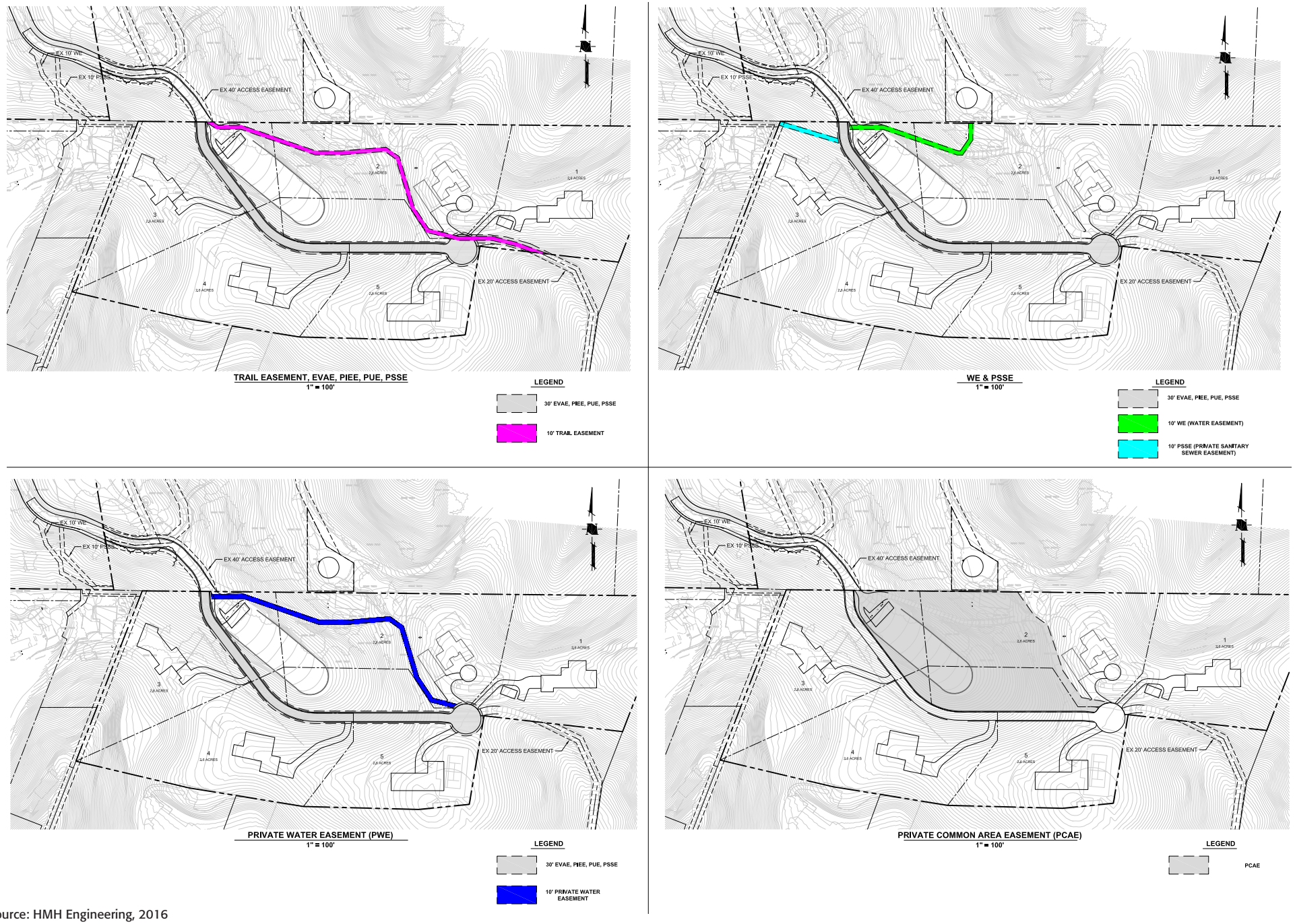


Source: HMH Engineering, 2016

FIGURE 4: Conceptual Private Street Grading
Shannon Road
Town of Los Gatos

Not to scale

Kimley»Horn

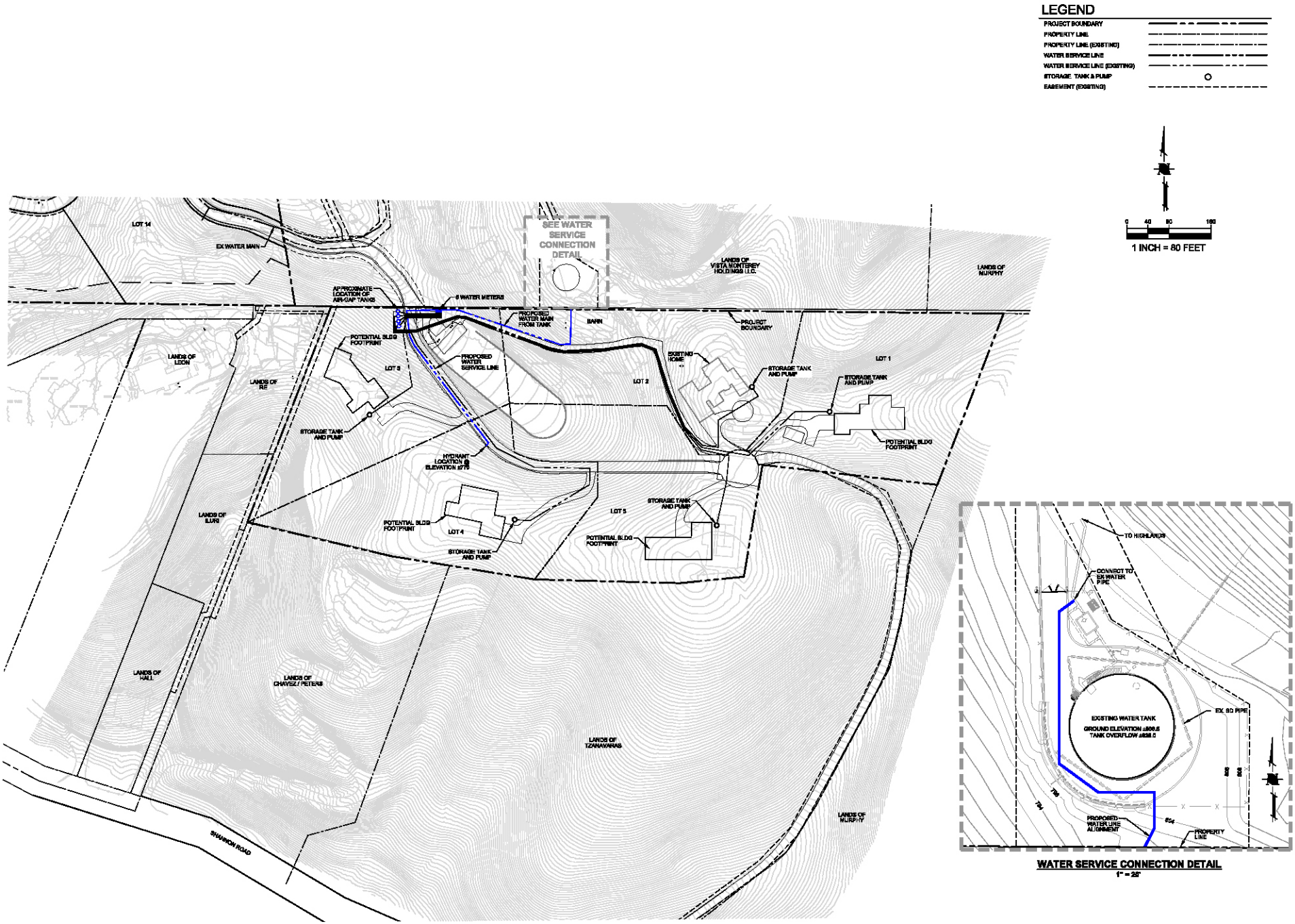


Source: HMH Engineering, 2016

FIGURE 5: Proposed Easements
Shannon Road
Town of Los Gatos

Not to scale

Kimley»Horn

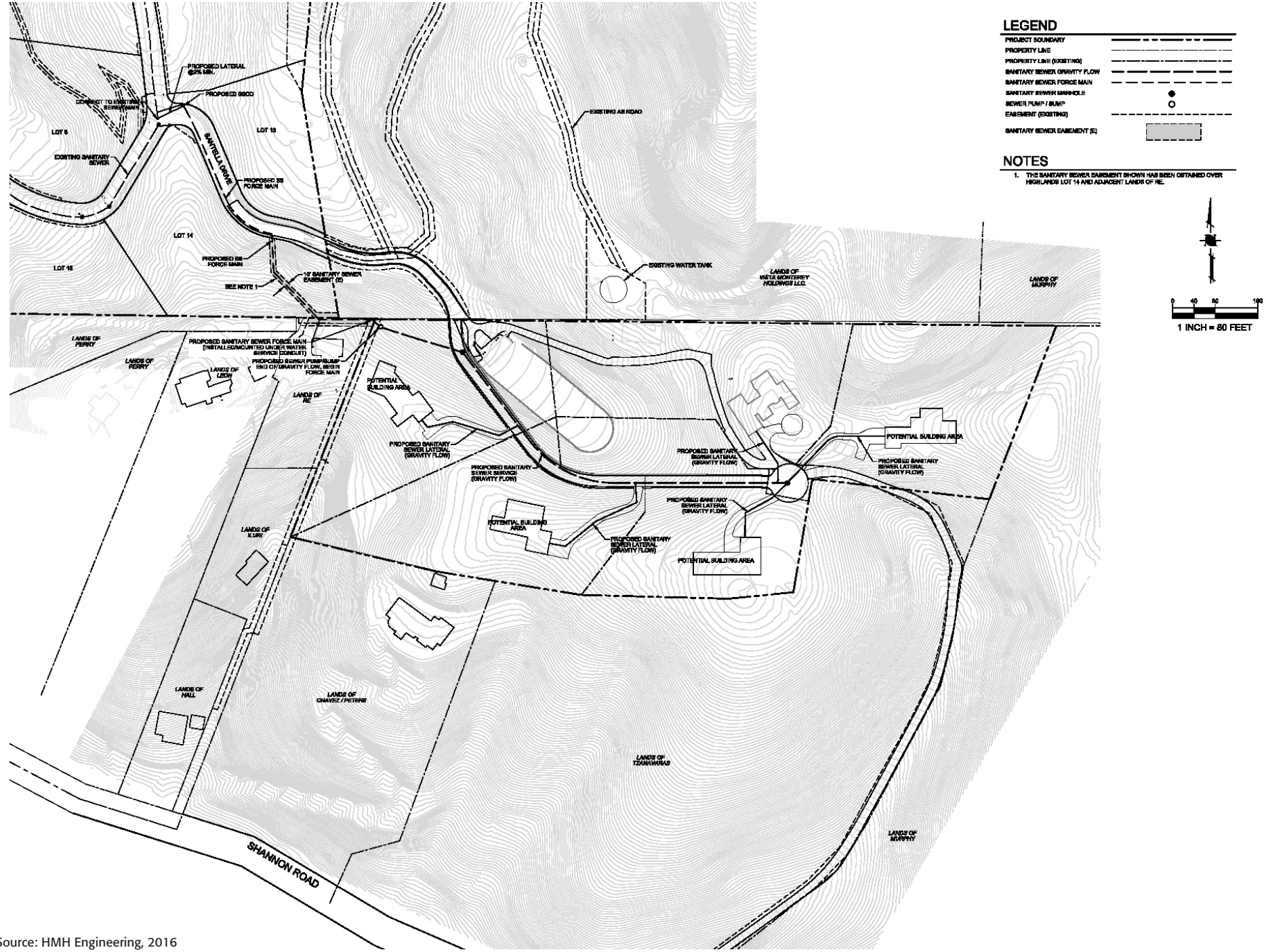


Source: HMH Engineering, 2016

FIGURE 6: Conceptual Water Plan
Shannon Road
Town of Los Gatos

Not to scale

Kimley»Horn



Source: HMH Engineering, 2016

FIGURE 7: Conceptual Sanitary Sewer Plan
Shannon Road
Town of Los Gatos

Not to scale

Kimley»Horn

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Environmental Checklist

Environmental Factors Potentially Affected by the Project

The environmental factors checked below would be potentially affected by this project, involving impacts identified as "Less Than Significant With Mitigation Incorporated" as indicated by the checklist on the following pages.

	Aesthetics		Agricultural Resources	X	Air Quality
X	Biological Resources	X	Cultural Resources	X	Geology / Soils
X	Hazards & Hazardous Materials		Hydrology / Water Quality		Land Use / Planning
	Mineral Resources	X	Noise		Population / Housing
	Public Services		Recreation	X	Transportation / Traffic
	Utilities / Service Systems		Mandatory Findings of Significance		

Determination

On the basis of this initial evaluation:

I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.	
I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.	X
I find that the proposed project MAY have a significant effect on the environment and an ENVIRONMENTAL IMPACT REPORT is required.	
I find that the proposed project MAY have a potentially significant or a potentially significant unless mitigated impact on the environment, but at least one effect (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.	
I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.	

_____ _____

Jennifer Armer, Associate Planner Date

Explanation of Environmental Checklist Responses

Aesthetics

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
1. AESTHETICS. Would the project:				
a) Have a substantial adverse effect on a scenic vista?			X	
b) Substantially damage scenic resources, including but not limited to trees, rock outcroppings, and historic buildings within a state scenic highway?			X	
c) Substantially degrade the existing visual character or quality of the site and its surroundings?			X	
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?			X	

(a, c) Scenic views and visual character

When specific development plans are submitted for the four future residences, pursuant to Town requirements, story poles would be placed on the site and their visibility from established viewing platforms would be determined at that time. Specific development plans for the future residences would also be subject to design review as part of the Architecture and Site (A&S) review process. As part of A&S review, the Town will require each home's design to be consistent with the Hillside Development Standards and Guidelines (HDS&G) for site planning, development intensity, architectural design, site elements, and landscape design as well as for light and glare. The HDS&G also emphasizes minimizing grading and preserving natural features (including drainage channels and trees).

The Town's HDS&G require a view analysis for each development project with the potential for being visible from any established viewing platform. A preliminary visual analysis from the established viewing platforms was completed by the project applicant's engineer, HMH, and the results of this analysis are presented on Sheets 7 through 8 of project plans. The HMH analysis indicates that the site is not visible from the Blossom Hill Road/Los Gatos Boulevard intersection Viewing Platform, Highway 9/Los Gatos Saratoga Road Viewing Platform, or the Main Street/Bayview Avenue Viewing Platform. Intervening trees or topography block views of the site from these three locations. The project site could be visible from the Los Gatos-Almaden Road/Selinda Way Viewing Platform. However, given the 1.36-mile distance between

the site and available views, future homes could be barely discernible depending on the color, design, location, and required tree removal. These factors would be considered during A&S to determine a future home's visibility from this viewing platform.

The proposed road and future homes could be visible from adjacent and nearby lands to the west, south, and east. There is a ridge to the north of the project site that would obscure or block most views of the proposed road and future homes from areas to the north. Proposed road and infrastructure construction that would occur initially would result in the removal or loss of up to 10 percent of the protected trees on the site. Proposed retention of more than 90 percent of the protected trees on the site would help to retain the visual character of the site. While this analysis acknowledges that some future project homes could be visible from adjacent or nearby areas, the Town's A&S review process would ensure that tree removal, building design, and landscape planting for future residences that are eventually proposed on lots created by project implementation would be consistent with the Town's design standards that guide residential development in hillside areas. The application of these guidelines, appropriate construction standards, and building code requirements would help to reduce any potential degradation of the visual character of the project vicinity.

(b) Scenic resources

The closest State Scenic Highway is Highway 9 in the City of Saratoga, approximately 2.8 miles west of the subject property (Caltrans, 2016). Given the distance, proposed road development and future home development, including future tree removals, would not be discernible. Views from this highway of the site are also blocked by intervening trees, development, and topography.

In addition, there are no scenic resources such as historic buildings or rock outcroppings on the project site. Therefore, the proposed project would not affect scenic resources as defined by CEQA, which can include, but are not limited to, trees, rock outcroppings, and historic buildings within a State-designated scenic highway. Consequently, the project would have a less-than-significant impact on state scenic highway resources.

(d) Create a new source of substantial light or glare

The project site is currently developed with a single-family residence and various recreational facilities, which are currently sources of light and glare. The initial phase of project implementation (i.e., when roads and infrastructure are constructed) would not introduce any new sources of light or glare because General Plan Policy TRA-7.8 prohibits installation of new public street lights on hillside streets, and therefore no street lights would be installed along the public street extension or private shared access drive. When future homes are eventually constructed, they would introduce new sources of indoor and outdoor lighting. The closest uses that would be most affected by nighttime lighting from project homes would be the residences adjacent to the project's western and southern boundaries. Proposed retention of 90 percent of existing protected trees would help to minimize the potential for significant disturbance due to nighttime lighting. During A&S review, proposed residential designs would be required to demonstrate project compliance with Town Code Section 29.10.09035, which prohibits the

production of direct or reflected glare (such as that produced by floodlighting) onto any area outside of the boundaries of a given property. This requirement would also preclude project lighting spillover onto any area outside of the property boundary, thereby avoiding potential lighting impacts on the residences along adjacent streets. Therefore, potential impacts with regard to project lighting would to be less than significant.

Source(s)

California Department of Transportation (Caltrans). 2016. Scenic Highway Routes. Web site: http://www.dot.ca.gov/hq/LandArch/16_livability/scenic_highways/scenic_hwy.htm. Accessed January 25.

Agriculture and Forestry Resources

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
2. AGRICULTURE RESOURCES. In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?				X
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?				X
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?				X
d) Result in the loss of forest land or conversion of forest land to non-forest use?				X

ENVIRONMENTAL IMPACTS **Issues**	**Potentially Significant Issues**	**Potentially Significant Unless Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?			X	

(a–e) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (farmland); conflict with existing zoning for agricultural use or a William Act contract; conflict with existing zoning for forest land; result in the loss of forest land, involve other changes resulting in a conversion of farmland or forest land

The project site is not designated as Prime Farmland, Unique Farmland, or Farmland of Statewide Importance. It is designated as "Other Land," which is land not included in any mapping category (FMMP, 2014). In addition, the project site not subject to a Williamson Act contract. It is designated as "Non-Enrolled Land" according to the Farmland Mapping and Monitoring service (DOC, 2013). In the Santa Clara County General Plan, the site is designated as within the Urban Service Area, and it is zoned for Hillside Residential use in the Town of Los Gatos Zoning Map (SCC, 2013; Town of Los Gatos, 2000). As such, the project would not result in the conversion of mapped farmland, conflict with an existing Williamson Act contract, or conflict with existing zoning for agricultural use.

Parcels to the southeast and northeast are subject to Williamson Act contracts, and the parcel to the east is under a Williamson Act contract for which non-renewal has been filed (DOC, 2013). Grading and residential development on the project site would not substantially conflict with these existing agricultural uses. These parcels are already in proximity to existing rural residential uses.

Neither the project site nor its surroundings are designated or zoned for forest or timber production uses.

Source(s)

Department of Conservation (DOC). Santa Clara County Williamson Act FY 2013/2014. 2013.

Farmland Mapping and Monitoring Program (FMMP). Santa Clara County Important Farmland 2012. 2014.

Santa Clara County (SCC). 1995 Santa Clara County General Plan. Land Use Plan. June 2013.

Town of Los Gatos. Town of Los Gatos Zoning Map. Adopted 2000.

Air Quality

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
3. AIR QUALITY. Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?			X	
b) Violate any air quality standard or contribute to an existing or projected air quality violation?		X		
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?		X		
d) Expose sensitive receptors to substantial pollutant concentrations?			X	
e) Create objectionable odors affecting a substantial number of people?			X	

The Bay Area Air Quality Management District (BAAQMD) adopted updated *CEQA Air Quality Guidelines*, including thresholds of significance, in May 2011. The Air Quality Guidelines advise lead agencies on how to evaluate potential air quality impacts, including establishing quantitative and qualitative thresholds of significance. The thresholds BAAQMD adopted were set aside by an Alameda County Superior Court ruling in March 2012. In May 2012, BAAQMD updated its CEQA Air Quality Guidelines to continue to provide direction on recommended analysis methodologies, but without recommended quantitative significance thresholds. In August 2013, the First District Court of Appeal reversed the Superior Court judgment and upheld the BAAQMD's CEQA thresholds.

In December 2015, the California Supreme Court held that CEQA does not generally require an agency to consider the effects of existing environmental conditions on a proposed project's future users or residents, such as the effects of toxic air contaminants and find particulate matter from existing sources on future residents or users of a project. Nevertheless, the Supreme Court stated that lead agencies still must evaluate existing environmental conditions in order to assess whether a project could exacerbate hazards that are already present. The

Supreme Court did not apply a holding to reach a conclusion on the validity of BAAQMD's receptor thresholds. Instead, the Supreme Court remanded the case to the Court of Appeal to decide the question in light of the Court's opinion. As of the date of this document, BAAQMD has not formally re-instated the thresholds.

The air quality impact analysis below uses the previously-adopted 2011 thresholds of the BAAQMD to determine the potential impacts of the project. While the significance thresholds adopted by BAAQMD in 2011 are not currently recommended by the BAAQMD, these thresholds are based on substantial evidence identified in BAAQMD's 2009 *Justification Report* (BAAQMD, 2009) and local agencies, such as the Town of Los Gatos, may rely on the BAAQMD thresholds.

(a) Consistent with air quality plans

The San Francisco Bay Area Air Basin (SFBAAB) is classified by BAAQMD as non-attainment for ozone and inhalable particulates (PM_{10}). To address these exceedances, BAAQMD, in cooperation with the Metropolitan Transportation Commission and the Association of Bay Area Governments, prepared the Bay Area 2005 Ozone Strategy (BAOS) in September 2005 and Particulate Matter Implementation Schedule (PMIS) in November 2005. The PMIS discusses how BAAQMD implements the California Air Resources Board's 103 particulate matter control measures. Later, BAAQMD adopted the 2010 Bay Area Clean Air Plan (CAP), which updates the BAOS.

BAAQMD guidance states that "if approval of a project would not result in significant and unavoidable air quality impacts, after the application of all feasible mitigation, the project would be considered consistent with the 2010 CAP" (BAAQMD, 2010a). Therefore, the project would be consistent with the CAP, and the impact would be less than significant.

(b–c) Project emissions

The BAAQMD Options and Justification Report establishes thresholds based on substantial evidence and are consistent with the thresholds outlined within the 2011 CEQA Air Quality Guidelines. Although BAAQMD did not undertake a CEQA review before completing its 2010 recommendations, Town staff believes that these recommendations, still represent the best available science on the subject of what constitute significant air quality effects in the SFBAAB. Those thresholds are shown in Table 1: Project Daily Construction Emissions.

Construction-Related Emissions. Short-term air quality impacts would occur during grading and construction activities associated with road and infrastructure improvements. Four additional homes would be constructed at some point in the future. During grading and construction activities, dust and exhaust emissions would be generated. Most of the dust emissions would result during grading activities. The amount of dust generated on a daily basis would be highly variable and would depend on the size of the area disturbed at any given time, amount of activity, soil conditions and meteorological conditions. Nearby receptors could be adversely affected by dust generated during construction activities.

Construction of roads and infrastructure is proposed to occur in one phase over a period of four to six months. In addition, during the grading phase, approximately 500 cubic yards of soil would be hauled off-site in 42 truckloads (84 one-way trips) using 12-cubic-yard trucks over about 20 work days. Estimated annual and average daily emissions generated by construction equipment and haul trucks are presented in Table 1: Project Daily Construction Emissions. As indicated in this table, construction exhaust emission estimates would not exceed the listed significance thresholds.

Table 1: Project Daily Construction Emissions

Emission	Pollutant			
	ROG	NO_x	PM_{10} (Exhaust)	$PM_{2.5}$ (Exhaust)
Construction (lb/day)	7.0	41.4	2.6	2.4
Threshold (lb/day)	54	54	82	54

Source: CalEEMod v. 2013.2.2 and Kimley-Horn and Associates, 2015.

Fugitive dust impacts would be mitigated through implementation of Mitigation Measure AIR-1, below.

Operational Emissions. When all project lots are eventually developed and homes are occupied, project residents would generate operational criteria pollutant emissions from both area and mobile sources associated with normal daily residential activities. Area source emissions would be associated with increased demand for electrical energy and natural gas by project residents. Mobile emissions would be generated by the use of motor vehicles by project residents.

Project-generated stationary area source and mobile source emissions were calculated using CalEEMod and results are presented in Table 2: Project Daily Operations Emissions. As indicated in Table 2, area source emissions from the proposed project would not exceed EIR significance thresholds for ROG, NO_X, PM_{10} and $PM_{2.5}$. Therefore, operational impacts from area and mobile source emissions would be less than significant.

Table 2: Project Daily Operations Emissions

Emission	Pollutant			
	ROG	NO_x	PM_{10} (Exhaust)	$PM_{2.5}$ (Exhaust)
Operations (lb/day)	0.86	0.31	0.21	0.00
Threshold (lb/day)	54	54	82	54

Source: CalEEMod v. 2013.2.2 and Kimley-Horn and Associates, 2015.

(d) Expose sensitive receptors to pollutant concentrations

BAAQMD specifically defines sensitive receptors as facilities or land uses that include members of the population that are particularly sensitive to the effects of air pollutants, such as children, the elderly, and people with illnesses. Examples include schools, hospitals and residential areas. The project area contains rural residential uses, which would be considered sensitive receptors.

Construction of the project would result in short-term diesel exhaust emissions (DPM), which are toxic air contaminants (TACs), from onsite heavy-duty equipment, as well as from soils-hauling activities. Exposure of sensitive receptors is the primary factor used to determine health risk. Exposure is a function of the concentration of a substance or substances in the environment and the extent of exposure that person has with the substance.

Based on interim guidance provided in *Screening Tables for Toxics Evaluation During Construction* (BAAQMD, 2010b), construction of projects with 5 residential units on 1.7 acres require a minimum offset distance of 95 meters from the project fence line to ensure that a less-than-significant impacts to sensitive receptors.[1] Most project construction activities would occur more than 95 meters from existing nearby sensitive receptors, and as such, those construction activities would not contribute to health risk impacts to sensitive receptors.

The portions of the proposed project that would be constructed within 95 meters of sensitive receptors are as follows:

- Construction of the house on Lot #3 would occur within 95 meters of the residence on the Lands of Re to the west;
- Construction of the house on Lot #4 would occur within 95 meters of the residence on the Lands of Chavez/Peters to the south; and
- Construction of the private roadway cul-de-sac would occur within 95 meters of the existing residence on Lot #2.

The State Office of Environmental Health Hazard Assessment (OEHHA) recommends that districts assume a minimum of two years of exposure for health risk analysis (BAAQMD, 2010b). Construction of each of these individual project components would not require two years of continuous operation of diesel equipment, and thus would not result in two years of DPM and TAC exposure. As such, based on the BAAQMD screening criteria, the limited construction

[1] BAAQMD notes that this minimum offset distance is based upon the conservative assumption that all on-road haul truck activity would occur along the project site fence line, and that all off-road construction activity would be concentrated on a quarter-acre area at the project fence line. The proposed project's on-road haul truck activity, as well as other construction activities, would occur at a variety of distances from the project site fence lines. In addition, the project would result in the construction of fewer residential units (four units vs. the five units in the BAAQMD guidance) over a larger project site (13 acres vs. 1.7 acres in the BAAQMD guidance). Therefore, the minimum offset distance for the project would be less than 95 meters, and the analysis included in this Initial Study provides a conservative assessment of health risk effects.

duration of these project components would be sufficient to avoid health impacts to their respective nearby sensitive receptors.

This impact would be less than significant.

(e) Odors

Land uses associated with odor complaints typically include wastewater treatment plants, landfills, confined animal facilities, composting stations, food manufacturing plants, refineries, and chemical plants. The existing horse stables on the project site could be considered an odor-generating use. This is an existing use, however, and the project would not result in the generation of new associated odors.

Operation of diesel equipment on-site, as well as from architectural coatings and asphalt off-gassing, could generation construction-related odors. These odors would be short-term in nature and would cease soon after project completion. Impacts to adjacent land uses would be short-term and less than significant.

Mitigation Measures – Air Quality (AIR)

Mitigation Measure AIR-1: BAAQMD-Recommended Basic Construction Mitigation Measures

To limit the project's construction-related dust and criteria pollutant emissions, the following the Bay Area Air Quality Management District (BAAQMD)-recommended Basic Construction Mitigation Measures shall be included in the project's grading plan, building plans, and contract specifications:

i. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day. Recycled water should be used wherever feasible.
j. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
k. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
l. All vehicle speeds on unpaved roads shall be limited to 15 mph.
m. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible.
n. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to five minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.

o. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.
p. Post a publicly visible sign with the telephone number and person to contact at the Town regarding dust complaints. This person shall respond and take corrective action within 48 hours. The BAAQMD's phone number shall also be visible to ensure compliance with applicable regulations.

Source(s)

BAAQMD. 2009. Revised Draft Guidelines and Justification Report.

BAAQMD. 2010a. California Environmental Quality Act Air Quality Guidelines. May 2010.

BAAQMD. 2010b. CEQA Tables for Air Toxics Evaluation During Construction. May.

Biological Resources

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
4. BIOLOGICAL RESOURCES. Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?		X		
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?				X
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?				X
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife			X	

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
corridors, or impede the use of native wildlife nursery sites?				
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?		X		
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?				X

Existing Setting. The subject property occupies about 13.0 acres of level to steeply sloping terrain of mostly unimproved land supporting non-native grasslands and woodlands. The dominant plant community on the site is coast live oak woodland, which presumably covered the entire project site prior to development. Approximately 1.4 acres are improved with a single-family residence, pool and deck, tennis court, five sheds (one includes a horse run), stables, horse arena, breaking ring, and paved drive. All grasslands in the vicinity of these facilities in addition to most or all of the area proposed for development has been cut for fire control.

Non-native grasses include Italian ryegrass *(Lolium multiflorum),* oats *(Avena sativa),* wild oats *(Avenafatua),* ripgut brome *(Bromus diandrus),* soft chess *(Bromus hordeaceus),* and zorro fescue *(Vulpia myuros).* Oak woodland in this area typically consists of coast live oak *(Quercus agrifolia)* with some blue oak *(Quercus douglasii)*, valley oak *(Quercus lobata)*, as well as California bay laurel *(Umbellularia californica).*

(a) Substantial adverse effect on candidate, sensitive, or special status species

The entire project site supports oak woodland and non-native grassland habitats. Based on biological surveys conducted on adjacent properties, the site has the potential to support suitable habitat for three special status species (CNPS List 1B: "Plants rare, threatened or endangered in California and elsewhere"): big-scale balsamroot (*Balsamorhiza macrolepis* var. *macrolepis*), Loma Prieta hoita (*Hoita strobilina*) and western leatherwood (*Dirca occidentalis*). It is unlikely that they presently occur within the areas proposed for development due to on-going, routine maintenance activities and vegetation clearing for fire prevention on the project site. Cutting of grassland areas and groundcover removal within the open oak woodland areas inhibits the establishment of these special-status plant species along with common grasses and

forbs that occur in the mixed oak woodland. Grasses on the project site are currently mowed weekly all year.

Within the study area, oak woodland habitat also provides nesting habitat for special-status bird species (i.e., Cooper's hawk, *Accipiter cooperi*), as well as many other migratory bird species. Site clearing activities (*e.g.,* grubbing, grading, trenching, and tree removal or pruning) could result in direct or indirect impacts to nesting birds by causing the destruction or abandonment of occupied nests. Direct and indirect impacts on special-status and migratory bird species would be considered significant under CEQA guidelines. Implementation of Mitigation Measure BIO-1 would reduce significant impacts on special-status and migratory bird species to a less-than-significant level.

Construction activities in the vicinity of occupied bat roosts could result in the destruction of the occupied roosts of special-status bat species (i.e., hoary bat, *Lasiurus cinereus*). In addition, disturbance during the maternity roosting season could result in potential roost abandonment and mortality of young. Direct and indirect impacts to special-status bat species would be considered significant under CEQA guidelines. Implementation of Mitigation Measure BIO-2 would reduce significant impacts on special-status bat species to a less-than-significant level.

An additional special-status species, San Francisco dusky-footed woodrat (SFDW, *Neotoma fuscipes annectens*), could also occur on the site considering the availability of abundant suitable habitat and the subspecies' occurrence in the project area. If present on the site or the project vicinity, project implementation could result in potentially significant impact on the species. However, implementation of Mitigation Measure BIO-3 would reduce this potential impact to less than significant.

(b) Substantial adverse effect on natural communities

Special-status natural communities are those that are considered rare in the region, support special-status plant or wildlife species, or receive regulatory protection under the Clean Water Act (CWA Sections 401 and 404), CDFW's Lake and Streambed Alteration Program (LSAP; Cal. Fish and Game Code Sections 1600-1607), and/or the Porter-Cologne Water Quality Control Act (Porter-Cologne; Cal. Water Code Sections 13000-14920). Vegetation alliances given a rarity ranking of G1, G2 or G3 are considered to be of high inventory priority; thus, impacts on habitats with these rankings may be regarded as significant pursuant to criteria derived from the CEQA Guidelines. Alliances ranked as G4 or G5 are generally considered common enough to not be of concern and mixed oak woodlands have a state rarity rating of G4.

Riparian habitats are considered by federal and State regulatory agencies to represent a rare and declining resource. Wetlands and riparian areas can serve significant biological functions by providing nesting, breeding, foraging, and spawning habitat for a wide variety of resident and migratory wildlife and fish species. Impacts on stream channels with a defined bed and bank, as well as adjacent riparian vegetation, are addressed specifically by the California Fish and Game Code (CFGC Sections 1600, et seq.) and may be regulated under the CWA and Porter-Cologne. There are no wetlands or riparian habitats on the project site and therefore, project

implementation would not adversely affects any special-status natural communities. However, as discussed below, potentially significant impacts on trees protected under local policies and ordinances would result from project implementation.

(c) Substantial adverse effect on wetlands

No riparian habitat or wetlands occur on the project site. Therefore, the project would have no direct impact on waters of the U.S. or state or any wetlands.

(d) Interfere or impede the movement of migratory fish or wildlife

Under CEQA, impacts on wildlife movement are considered significant if a project would interfere substantially with the movement of native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites. Properties to the northeast, east, and southeast are rural in nature and support extensive and connected non-developed private and preserved open space lands, and the project vicinity is wooded. The project site and properties to the west, however, can be characterized as more intensively developed with residential and horse facilities. With this development pattern, the habitats on the site are not considered connected to the non-developed habitat on contiguous lands to the northeast, east, and southeast. With the exception of birds and mammals accustomed to human activities, the project site is not expected to provide significant resources for wildlife species. For these reasons, the proposed project would have a less-than-significant impact on wildlife movement, significant corridors, or nursery sites.

(e) Conflict with local policies or ordinance include tree preservation

Protected Trees. The Town of Los Gatos's Tree Protection Ordinance regulates the removal of trees within the Town in order to retain as many trees as possible consistent with the reasonable use of private property. Prior to the removal of any protected tree, except under certain exceptions, a permit must be obtained from the Town. If protected trees must be removed, the Los Gatos Tree Protection Ordinance states that the preferred tree replacement is two or more trees of a species and size designated by the Director of the Parks and Public Works Department. Tree replacement requirements are based on canopy size, which is defined in Table 3-1 of the Ordinance, *Tree Canopy – Replacement Standard.* Tree canopy replacement requirements range from two to six 24-inch box size trees or two 36-inch and/or 48-inch box size trees, depending on the canopy size of the tree to be removed.

Based on the arborist's preliminary report (Attachment B), there are 169 protected trees on the subject property. Development of the proposed road and infrastructure would require the removal of 5 protected trees that are native coast live oaks (#138, 149, 151, 157, and 159), which represents about 3% of the protected trees on the site. An additional 11 trees (one English holly and ten coast live oaks), approximately 7% of the protected trees, could be within or very close to the limits of grading for the roadway and could require removal (#66, 69, 71, 135, 148, 152, 154, 160, 161, 163, and 164). Proposed tree removal would be a potentially significant impact. However, implementation of the Mitigation Measure BIO-4 in addition to compliance with the Town's Tree Ordinance would ensure that trees removed or damaged by proposed development would be replaced and this impact would be reduced to a less-than-

significant level. The arborist, Debbie Ellis, also notes that removal or loss of some of these identified trees could be avoided by more precise location of tree trunks on project plans.

Future development of homes on the four project lots could result in the removal of additional protected trees. When specific development plans are submitted for these future homes, any proposed tree removals would be subject to the Architecture and Site review process and would require a tree removal permit.

(f) Conflict with adoption habitat conservation or natural community conservation plans

There is no adopted habitat conservation plan or natural community plan that covers the project site. The proposed project would not conflict with any approved local, regional, or state habitat conservation plan (no impact).

Mitigation Measures – Biological Resources (BIO)

The measures outlined below shall be implemented to avoid, minimize, or mitigate potential future impacts on biological resources that could result as each project lot is developed. Prior to issuance of a building permit for the construction of the proposed road and infrastructure and development of each lot, the following measures shall be implemented to reduce potential impacts on these species, if found to be present, to a less-than-significant level:

Mitigation Measure BIO-1: Special-status and Migratory Bird Species.

The following avoidance measures shall be required to avoid the project's potential effects on Cooper's hawk, and other special-status and migratory bird species.

a. *Raptor Nests.* Prior to the removal or significant pruning of any trees, they shall be inspected by a qualified biologist for the presence of raptor nests. This is required regardless of the season. If a suspected raptor nest is discovered, the California Department of Fish and Wildlife (CDFW) shall be notified. Pursuant to California Fish and Game Code (CFGC) Section 3503.5, raptor nests, whether or not they are occupied, may not be removed until approval is granted by the CDFW.

b. *Tree Work Outside of Breeding Season*. If clearing and grubbing and tree removal or pruning are to be conducted outside of the breeding season (i.e., September 1 through January 31), no preconstruction surveys for nesting migratory birds is necessary.

c. *Tree Work During Breeding Season*. If clearing and grubbing and tree removal or pruning are to be conducted during the breeding season (i.e., February 1 through August 31), a preconstruction nesting bird survey shall be conducted. The survey shall be performed by a qualified biologist no more than two weeks prior to the initiation of work. Preconstruction surveys should include all trees, large shrubs, or other areas of potential nesting habitat within the construction footprint or within 250 feet of the footprint. If no nesting or breeding activity is observed, work may proceed without restrictions. To the extent allowed by access, all active nests

identified within 76 m (250 feet) for raptors and 15 m (50 feet) for passerines shall be mapped.

d. For any active nests detected near the construction limits (76 m [250 feet] for raptors and 15 m [50 feet] for passerines), the qualified biologist shall make a determination as to whether or not construction activities are likely to disrupt reproductive behavior. If it is determined that construction is unlikely to disrupt breeding behavior, then construction may proceed. If it is determined that construction may disrupt breeding, then a suitable construction-free buffer should be established around all active nests where disruption of breeding may occur. The precise dimension of the buffer (up to 250 ft) would be determined at that time and may vary for each nest depending on location, species, topography, lines of site between the work area and the nest, physical barriers, and the ambient level of human activity. The buffer areas should be enclosed with temporary fencing, and construction equipment and workers should not enter the enclosed setback areas. Buffers should remain in place for the duration of the breeding season or until it has been confirmed by a qualified biologist that all chicks have fledged and are independent of their parents

e. If maintenance of a no-construction buffer zone is not feasible, the qualified biologist shall monitor the nest(s) to document breeding and rearing behavior of the adult birds. If it is determined that construction activities are likely to cause nest abandonment, work shall cease immediately and the CDFW and/or the United States Fish and Wildlife Service (USFWS) Division of Migratory Bird Management shall be contacted for guidance. Work may not resume until an agreement has been reached with the authorities specifying the conditions under which work may proceed.

Mitigation Measure BIO-2: Special-status Bats

The following avoidance measures shall be required to avoid the project's potential effects on hoary bat or other special-status bat species.

e. A preconstruction survey shall be conducted by a qualified biologist to identify suitable bat roosting sites. If no evidence of roosting is detected, no further avoidance or minimization measures are necessary.

f. Any trees determined to support or potentially support maternal roosting sites may only be removed or demolished under guidance and recommendations of the bat biologist to avoid and minimize impacts and comply with the CDFG. Passive exclusion of roosting bats would be required and this may only be performed during the non-breeding season (i.e., between September 15 and March 1).

g. Any trees determined to provide suitable day or night roosting sites shall be identified and marked on site plans. Such roosting sites include snags, rotten stumps, and decadent trees with broken limbs, exfoliating bark, cavities, openings leading to interior portions of any structures. If no suitable roost sites or evidence of

bat roosting are identified, impact minimization measures are not warranted. If suitable roosting sites or evidence of bat roosting are identified, the following measures shall be conducted:

i. A qualified biologist shall survey suitable roost sites immediately prior to the removal or significant pruning of any of the larger trees, or demolition or significant renovation of any structures.

ii. If the qualified biologist identifies suitable day or night roost sites or evidence of bat occupation, the following steps shall be followed to discourage use of the sites by bats and to ensure that any bats present are able to safely relocate.

For trees:

- Tree limbs smaller than 7.6 cm (3 in) in diameter shall be removed and any loose bark shall be peeled away.
- Any competing limbs that provide shelter around the potential roost site shall be removed to create as open of an area as possible.
- The tree shall then be left alone to allow any bats using the tree/snag to find another roost during their nocturnal activity period.
- The qualified biologist shall survey the trees a second time 48 hours after trimming.
- If no bats are present, work may proceed.
- If bats remain on the site, additional measures would be prescribed by the biologist.

h. Pre-demolition bat surveys should be conducted to determine if bats are present in structures onsite. If no bats are observed to be roosting in structures identified as potentially suitable habitat, then no further action is required, and dismantling of the structures can proceed. However, if bats are found to be roosting in structures on the site, the project proponents shall exclude bats prior to dismantling any structures to ensure no harm or take would occur to any bats as a result of demolition activities. Dismantling of structures should occur after September 15 and before March 1 to avoid interfering with an active nursery. If a non-breeding bat colony is found in the structures, the individuals should be safely evicted under the direction of a qualified bat biologist through a “partial dismantle” process, whereby the roosting area is opened to allow airflow through and sunlight into the structure, making it unsuitable habitat and undesirable for the bats to return to the site. Full dismantling should then follow no later than the following day (i.e., there should be no less than one night between initial disturbance for airflow and the demolition). This action should allow bats to leave during the night, thus increasing their chances of finding new roosts with a minimum of potential predation during daylight hours.

Mitigation Measure BIO-3: San Francisco Dusky-footed Woodrat (SFDW)

To ensure no take of SFDW occurs, the following protective measures shall be followed.

e. A pre-construction wildlife survey shall be performed prior to any land clearing activities within the identified construction area to search for woodrat nests. If no nests are detected, no further avoidance measures are warranted.

f. If a woodrat nest is detected, it shall be mapped in relation to the proposed limits of work. If the nest can be avoided, it shall be isolated from the work zone by installation of wildlife exclusion fencing.

g. If a woodrat nest is in the work zone and it cannot be avoided, site clearing shall be performed during the non-breeding season (e.g., September 1 through November 30). During the non-breeding season, the nest shall be disassembled by hand and the nest materials (e.g., sticks) removed and disposed of off-site. Any adult animals will be passively relocated into the adjacent woodland habitat. This work shall be supervised by a qualified biologist. Upon completion, the biologist shall notify CDFW of the translocation work.

h. If site clearing must proceed during the breeding season, it will be necessary to determine whether or not the nest is currently occupied. This may be done by direct observation over the course of at least two evenings no more than 48 hours prior to nest disassembly. Direct observation may consist of installation of wildlife cameras at the nest or by a biologist on the ground. If no animals are observed, the nest may be disassembled by hand. If, during the process of disassembling the nest, live animals are encountered, nest materials shall be replaced on top of the nest and the effort abandoned. Nests may not be disassembled if young woodrats are present. Construction must then be postponed until the end of the breeding season.

Mitigation Measure BIO-4: Tree Replacement and Protection

Prior to the removal of any trees, a tree removal permit shall be obtained from the Town of Los Gatos, and all of the conditions of the permit shall be followed during tree removal. Tree replacement plantings shall be in conformance with Table 3-1 (Tree Canopy-Replacement Standard) of the Town's Tree Protection Ordinance and Appendix A of the Hillside Development Standards and Guidelines.

The project applicant shall be required to implement recommendations made by the Town's consulting arborist, Deborah Ellis, MS, in the report dated June 15, 2015 as well as any subsequent updates. These recommendations are included in Attachment B.

Source(s)

Deborah Ellis, MS. 2015. Preliminary Arborist Report: 15215 Shannon Road. June 15.

Live Oak Associates, Inc. 2016. Peer review of the biological resources section of an Initial Study for the Property at 15215 Shannon Road in Los Gatos, California (PN 2003 – 01). January 21.

Cultural Resources

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
5. CULTURAL RESOURCES. Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in CEQA Guidelines section 15064.5?			X	
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to section 15064.5?		X		
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?		X		
d) Disturb any human remains, including those interred outside of formal cemeteries?		X		

(a) Historic resources

The project would involve the demolition of sheds, a tennis court, pool and deck, and other ancillary structures. No historic resources would be affected.

(b) Archaeological resources

Portions of the area proposed for development was disturbed to allow for construction of the existing residence and associated outbuildings and facilities, and the potential for encountering intact archaeological resources would be low due to this previous surface disturbance. Given the project site's lack of open areas and seasonal water resources (needed for hunting camps and/or occupation areas), there would be a low potential for encountering archaeological resources or human remains. Regardless, there remains a small possibility that buried prehistoric resources could be encountered or damaged, which would result in a potentially significant impact. Implementation of Mitigation Measure CUL-1, Archaeological Resources, would reduce this potential impact to a less-than-significant level.

(c) Paleontological/unique geological resources

Paleontological resources are the fossilized remains of plants and animals, including vertebrates, invertebrates, and microscopic plants and animals. The age and abundance of fossils depend on the location, topographic setting, and particular geologic formation in which they are found. Fossil discoveries not only provide an historic record of past plant and animal life, but may assist geologists in dating rock formations. There are no known paleontological

sites recorded in or adjacent to Los Gatos (Town of Los Gatos, 2010). The potential for encountering paleontological resources, however, cannot be completely eliminated. Implementation of Mitigation Measure CUL-2 would ensure associated impacts are reduced to a less-than-significant level.

Additionally, no unique geological features are present on the site. Therefore, development of the site would not result in significant impacts on unique geological features.

(d) Human remains

There is no indication from the archival research results that any part of the project site has been used for human burial purposes in the recent or distant past. It is unlikely that human remains would be encountered during construction of the proposed project. However, the possibility of inadvertent discovery cannot be entirely discounted, and would result in a potentially adverse impact. In the event of the discovery of human remains during project construction activities, implementation of the Mitigation Measure CUL-3 would reduce potential impacts to a less-than-significant level.

Mitigation Measures – Cultural Resources (CUL)

Mitigation Measure CUL-1: Archaeological Resources

Construction personnel involved with earthmoving shall be alerted to the potential for the discovery of prehistoric materials. Prehistoric archaeological materials might include obsidian and chert flaked-stone tools (e.g., projectile points, knives, scrapers) or toolmaking debris; culturally darkened soil ("midden") containing heat-affected rocks, artifacts, or shellfish remains; and stone milling equipment (e.g., mortars, pestles, handstones, or milling slabs); and battered stone tools, such as hammerstones and pitted stones. Historic-period materials might include stone, concrete, or adobe footings and walls; filled wells or privies; and deposits of metal, glass, and/or ceramic refuse.

If prehistoric or historic-period archaeological resources are encountered, all construction activities within 50 feet shall halt and the Community Development Director shall be notified. A Secretary of the Interior-qualified archaeologist shall inspect the findings within 24 hours of discovery. If it is determined that the project could damage a historical resource or a unique archaeological resource (as defined pursuant to the CEQA *Guidelines*), mitigation shall be implemented in accordance with Public Resources Code (PRC) Section 21083.2 and Section 15126.4 of the CEQA *Guidelines*, with a preference for preservation in place. Consistent with Section 15126.4(b)(3), this may be accomplished through planning construction to avoid the resource; incorporating the resource within open space; capping and covering the resource; or deeding the site into a permanent conservation easement. If avoidance is not feasible, a qualified archaeologist shall prepare and implement a detailed treatment plan in consultation with Community Development Department. Treatment of unique archaeological resources shall follow the applicable requirements of PRC Section 21083.2. Treatment for most resources shall consist of (but would not be not limited to) sample excavation, artifact collection, site documentation, and historical research, with the aim to target the

recovery of important scientific data contained in the portion(s) of the significant resource to be impacted by the project. The treatment plan shall include provisions for analysis of data in a regional context, reporting of results within a timely manner, curation of artifacts and data at an approved facility, and dissemination of reports to local and state repositories, libraries, and interested professionals.

Mitigation Measure CUL-2: Paleontological Resources

Prior to the commencement of construction activities, the project applicant or its successor(s) in interest shall provide for a qualified paleontologist to provide construction personnel with training on procedures to be followed in the event that a fossil site or fossil occurrence is encountered during construction. The training shall include instructions on identification techniques and how to further avoid disturbing the fossils until a paleontological specialist can assess the site. An informational package shall be provided for construction personnel not present at the meeting.

In the event that a paleontological resource (fossilized invertebrate, vertebrate, plant or micro-fossil) is found during construction, excavation within 50 feet of the find shall be temporarily halted or diverted until the discovery is evaluated. Upon discovery, the Community Development Director shall be notified immediately and a qualified paleontologist shall be retained to document and assess the discovery in accordance with Society of Vertebrate Paleontology's 2010 Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources, and recommend procedures to be followed before construction is allowed to resume at the location of the find. If the Community Development Director determines that avoidance is not feasible in light of project design, logistics, and costs, the paleontologist will prepare a recommended excavation plan, subject to review and approval by the Community Development Director, for mitigating the project's impact on this resource, including preparation, identification, cataloging, and curation of any salvaged specimens.

Mitigation Measure CUL-3: Human Remains

In the event of discovery or recognition of any human remains during construction activities, such activities within 50 feet of the find would cease until the San Mateo County Coroner has been contacted to determine that no investigation of the cause of death is required. The Native American Heritage Commission (NAHC) shall be contacted within 24 hours if it is determined that the remains are Native American. The NAHC would then identify the person or persons it believes to be the most likely descendant from the deceased Native American, who in turn would make recommendations to the Town of Los Gatos for the appropriate means of treating the human remains and any grave goods.

Source(s)

Town of Los Gatos. 2010. 2020 General Plan Draft Environmental Impact Report. March 10.

Geology and Soils

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
6. GEOLOGY AND SOILS. Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault?			X	
ii) Strong seismic ground shaking?		X		
iii) Seismic-related ground failure, including liquefaction?		X		
iv) Landslides?		X		
b) Result in substantial soil erosion or the loss of topsoil?			X	
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?		X		
d) Would the project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?		X		
e) Would the project have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?				X

The project applicant has a geotechnical feasibility study prepared for the project (UPP, 2015). The study was reviewed by the Town engineer, which concluded that the study adequately addresses geologic and seismic hazards with respect to the proposed subdivision, as well as establishes a feasible infrastructure plan and feasible building envelopes for the four proposed

residences (Wright, 2015). The discussion below presents the findings of the geotechnical report, as well as any identified mitigation to reduce impacts to a less-than-significant level.

(a) Seismic hazards

The San Francisco Bay Area is an active seismic region with activity related to the San Andreas fault system, which is a major rift in the earth's crust that extends for at least 700 miles along the California Coast. The project site is located approximately 4 miles from the San Andreas fault, 11 miles from the Hayward Fault, 14 miles from the Calaveras fault, and 21 miles from the San Gregorio fault. These four major faults have produced approximately 12 earthquakes per century strong enough to cause structural damage.

The project site is mapped between two traces of the Shannon fault (between approximately 1,000 feet and 1,600 feet from the center of the project site), which is a component of the frontal thrust fault system along the eastern side of the Santa Cruz Mountains. There is no known active or potentially active faults on the project site. As such, the project would not result in hazards associated with fault rupture.

Regarding ground-shaking, the project site would be subject to strong ground-shaking equal to a Modified Mercalli (MM) intensity of VII, which generally causes slight damage in well-built ordinary structures, and considerable damage in well-built ordinary buildings. Damage varies depending on earthquake location and intensity. The impact would be less than significant with adherence to Mitigation Measure GEO-1.

The project site is located atop a hill and is mapped within a State Seismic Hazard zone for earthquake-induced landsliding. A shallow, slump-type landslide measuring approximately 130 feet long by 45 feet wide is located on the west-southwest facing slope of the project site, but the Monterey shale formation underlying the site does not appear to be generally susceptible to landslides. There is a negligible risk of a deep-seated landslide that would impact the proposed project building areas, but the occurrence of a new shallow (less than 10 feet deep) landslide cannot be ruled out. Such a landslide would not constitute an immediate threat to structures built within the proposed building envelopes, provided they are constructed in accordance with a project-specific geotechnical study, as required in Mitigation Measure GEO-1.

(b) Erosion

The irregular-shaped project site is situated along the crest of Blossom Hill Ridge. The topography at the eastern portion of the site consists of an east-west trending spur ridge, which branches into two northwest-trending spur ridges in the central portion of the site. Between the two spur ridges is a northwest-trending swale that slopes gently to moderately downward toward the northwest. The swale is occupied by the existing horse arena, which is proposed to remain. The site's average slope is calculated to be approximately 23.5 percent with 1.1 acres having slopes more than 50 percent and 11.9 acres having slopes of less than 50 percent.

Estimated earthwork volumes for proposed road construction would be approximately 1,800 cubic yards of cut and 1,300 cubic yards of fill, resulting in a net export of 500 cubic yards. Given the site's sloping topography and the proposed extent of surface disturbance, there would be a potential for erosion hazards if soils were subject to concentrated runoff flows. As explained in the Hydrology and Water Quality analysis, below, the project would be subject to the National Pollutant Discharge Elimination System (NPDES) Construction General Permit, which requires the preparation of a Stormwater Pollution Prevention Plan (SWPPP). This plan would incorporate erosion control measures that would reduce construction erosion impacts. In addition, pursuant to Town of Los Gatos Code Section 12.20.050, an erosion and sediment control plan shall be required whenever the graded portion of a site includes more than 10,000 square feet having a slope greater than 5 percent. The plan would include an effective revegetation program to stabilize all disturbed areas which will not be otherwise protected. The plan shall include measures to prevent increased discharge of sediment at all stages of grading and development from initial disturbance of the ground to project completion. Therefore, with adherence to existing Statewide and local regulations, erosion impacts would be less than significant.

(c–d) Soil stability

As indicated above, the possibility of shallow landslides at the project site cannot be excluded. Risks associated with those landslides would be reduced to a less-than-significant level through implementation of Mitigation Measure GEO-1.

Shallow bedrock is anticipate at the location of building sites on ridge tops. Given that the building sites are generally level with limited gentle sloping, the buildings would be feasible from a geologic and geotechnical standpoint. Pursuant to Mitigation Measure GEO-1, buildings would be constructed in accordance with project-specific geotechnical requirements, which may include standard drilled pier and grade beam foundations where colluvium or fill thickness exceeds several feet, and/or removal of colluvium and replacement with engineered fill. The project access road and site roadways would also be subject to their own project-specific geotechnical analysis and recommendations, pursuant to Mitigation Measure GEO-1.

(e) Soil capability to support septic tanks or alternative wastewater disposal systems where sewers are not available

The proposed project would not include installation of septic tanks. As stated in the Project Description, gravity sewer laterals would connect the five residences to a gravity sewer in the private roadway connecting to the Santella Drive extension. Wastewater would flow to the northwest corner of the project site, where it would be pumped via a force main through an easement to the existing Santella Drive. Wastewater would then flow to the existing sanitary sewer in Shady Lane. Pipe sizing and safe bearing loads for project site soils would be in accordance with the Uniform Plumbing Code. West Valley Sanitation District would provide service for the project site and review proposed service connections. Therefore, the project would not result in the construction of septic tanks in soils inadequate to support such facilities.

Mitigation Measures – Geology and Soils (GEO)

Mitigation Measure GEO-1: Geotechnical Investigation

For the proposed roadway and each proposed residential unit, the project applicant(s) shall consult with a registered geotechnical engineer to prepare a design-level geotechnical investigation that incorporates the recommendations in the *Geologic and Geotechnical Feasibility Study: Proposed Five-Lot Subdivision, Sahadi Property* (UPP Geotechnology, 2015). The design-level geotechnical report shall address, but not be limited to, site preparation and grading, building foundations, and CBC seismic design parameters. A design-level geotechnical report shall be prepared and submitted in conjunction with Building Permit application(s) and reviewed and approved by the Town of Los Gatos. Recommendations from the design-level geotechnical report shall be incorporated into the final project design and construction documents.

Source(s)

UPP Geotechnology (UPP). 2015. Geologic and Geotechnical Feasibility Study: Proposed Five-Lot Subdivision, Sahadi Property. March 19, 2015.

Wright, Bob. 2015. E-mail to Trang TuNguyen. Subject: 15215 Shannon Road. March 13.

Greenhouse Gas Emissions

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
7. GREENHOUSE GAS EMISSIONS. Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?			X	
b) Conflict with applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?			X	

As stated above in the discussion under Air Quality, the Town of Los Gatos relies upon on the thresholds within the Options and Justification Report (dated October 2009) prepared by BAAQMD. BAAQMD's recommended thresholds are as follows:

- Compliance with a Qualified Climate Action Plan or
- Emissions below one of the following thresholds:

- 1,100 metric tons of carbon-dioxide equivalent emissions (MT CO_2e) per year; or
- 6.7 MT CO_2e per capita per year (residential) / 4.6 MT CO_2e per service population per year (mixed use)

For purposes of this report, project compliance with the 1,100 MT CO_2e/year threshold is used as the primary basis to determine significance. The project's consistency with operative goals and policies of the Sustainability Plan that are designed to avoid environmental impacts also are also analyzed.

Construction Emissions

BAAQMD's Options and Justification Report does not recommend a significance threshold for construction-related greenhouse gas emissions. Therefore, to estimate the annual emissions that would result from construction activity associated with the proposed project, GHGs from construction projects were quantified and amortized over a 50-year period. The emissions were then added to the annual average operational emissions and compared to the applicable operational thresholds.

A net of 500 cubic yards of soils would be exported from the project site over a period of approximately 20 days. These haul trips would be the primary generator of construction-related GHG emissions, although other construction activities would also generate emissions. Annualizing total construction GHG emissions using this methodology accurately accounts for temporary construction emissions as part of the proposed project's annual GHG emissions, which are compared to the applicable annual GHG threshold. Based on these assumptions, construction emissions were estimated individually using the California Emissions Estimator Model (CalEEMod).

On-Site Operational Emissions

Operational emissions from energy use (electricity and natural gas use) for the proposed project were also estimated using CalEEMod (see Attachment A). The default values on which CalEEMod are based include the California Energy Commission (CEC)-sponsored California Commercial End Use Survey (CEUS) for non-residential land uses and Residential Appliance Saturation Survey (RASS) for residential land uses. This methodology is considered reasonable and reliable for use, as it has been subjected to peer review by numerous public and private stakeholders, and in particular by the CEC. It is also recommended by the California Air Pollution Control Officers Association CAPCOA (January 2008).

Emissions associated with area sources—including consumer products, landscape maintenance, and architectural coating—were calculated in CalEEMod based on standard emission rates from the California Air Resources Board (CARB), the United States Environmental Protection Agency (U.S. EPA), and district supplied emission factor values (CalEEMod User's Guide, 2013).

Emissions from waste generation were also calculated in CalEEMod and are based on the International Panel on Climate Change's (IPCC's) methods for quantifying GHG emissions from solid waste using the degradable organic content of waste (CalEEMod User's Guide, 2013).

Waste disposal rates by land use and overall composition of municipal solid waste in California was based on data provided by the California Department of Resources Recycling and Recovery (CalRecycle).

Emissions from water and wastewater usage calculated in CalEEMod were based on the default electricity intensity from the CEC's 2006 Refining Estimates of Water-Related Energy Use in California using the average values for Northern and Southern California.

Direct Emissions from Mobile Combustion

Emissions of carbon dioxide (CO_2) and methane (CH_4) from transportation sources for the proposed project were quantified using CalEEMod. Although the CalEEMod computer program does not calculate nitrous oxide (N_2O) emissions from mobile sources, the proposed project's four net new units would generate minimal trips and vehicle miles traveled (VMT) such that N_2O emissions would be minimal.

(a) Generate greenhouse gas (GHG) emissions

Construction

Based on the project construction activity, approximately 541 $MTCO_2$-equivalent would be emitted over an estimated 14-month construction period. The GHG emissions from construction activities are considered in the following context. First, the period of construction would be relatively short-term at 14 months compared to the expected 50-plus-year life of the proposed project. The construction phase GHG emissions, when amortized over 50 years, would be approximately 11 $MTCO_2e$ per year, which is substantially less than the 1,100 MT CO_2e per year threshold used by the Town.

Operations

Long-term operation of the proposed project would cause direct and indirect GHG emissions (primarily CO_2) from use of the carbon-based fuels (gasoline and diesel fuel) by residents, on-site maintenance vehicles, off-site delivery vehicles, and personal vehicles. SF_6 GHG emissions could also result from electrical equipment leakage from utilities serving the project site, but such emissions would be small in quantity and easily be controlled or minimized because the gas is required to be recycled. Routine and safe operation requires that SF_6 be contained within electric power equipment. PFCs and HFCs, are not included in the operational emissions calculation because accurate data for usage and storage of these compounds is difficult to obtain, and their emissions primarily result from industrial processes and electric power transmission and distribution systems, not from residential uses.

The proposed project would emit approximately 54.6 MT CO_2e per year (see Attachment A), directly from on-site activities and indirectly from off-site motor vehicles. This level of emissions would be substantially less than the 1,100 MT CO_2e per year threshold used by the Town.

(b) Conflict with GHG plans or regulations

Assembly Bill (AB) 32 establishes regulatory, reporting, and market mechanisms to reduced statewide GHG emissions to 1990 levels by 2020. Pursuant to this requirement, the California Air Resources Board (CARB) adopted its Scoping Plan, which contains the main strategies to achieve required reductions by 2020. As indicated above, the project's construction-related and operational GHG emissions would not exceed the 1,100 MT CO_2e threshold used by the Town, which is based upon the Options and Justification Report. Therefore, the project's GHG emissions would not conflict with plans and policies adopted for the purpose of reducing GHG emissions, a less-than-significant impact.

The Town of Los Gatos Sustainability Plan, adopted in 2012, outlines communitywide GHG emission reduction measures necessary to reduce GHG emissions in Los Gatos. By 2020, the Sustainability Plan documents that GHG emissions would be reduced by approximately 15 percent from the business-as-usual (BAU) assumption. The Sustainability Plan does contain a number of binding GHG reduction measures. Most of the Sustainability Plan's GHG reduction measures, however, would apply to future home designs and each home's consistency with these measures would be evaluated during A&S and building permit review to ensure compliance. Consistency of the project's initial phases of road and infrastructure construction with pertinent GHG reduction measures is discussed Table 3: Sustainability Plan Consistency, below. The project would not conflict with the Town's Sustainability Plan assuming compliance with Town Code requirements.

Table 3: Sustainability Plan Consistency

GHG Emissions Reduction Measures	Project Compliance
GB-1: Green Building Ordinance. Develop a Green Building Ordinance that requires energy-efficient design, in excess of Title 24 standards, for all new residential and non-residential buildings. When developing the Ordinance, consider development-level thresholds for when certain requirements are triggered. • Require 30 percent above the 2008 Building and Energy Efficiency standards in Title 24 to coincide with the Voluntary Tier 2 standards of the California Green Building Code (CALGreen). • Encourage the use of cement substitutes and recycled building materials for new construction. • EC-1: Energy-Efficient Appliances and Lighting. Require new development to use energy-efficient appliances that meet ENERGY STAR standards and energy-efficient lighting technologies that exceed Title 24 standards by 30%.	Although this measure is applicable to the Town and not to individual development projects, the to-be-developed Green Building Ordinance would be applicable to the four residential units to be constructed on the project site (depending on the relative timing of ordinance adoption.) If in effect at the time of residential unit building applications, home designs would be required comply with this ordinance. Prior to issuance of building permits, proposed home designs and appliance/lighting specifications will be evaluated for consistency with ordinance requirements.

GHG Emissions Reduction Measures	Project Compliance
GB-2 GreenPoint Rated Building Guidelines. Require all new and significantly remodeled homes to follow the Town's adopted GreenPoint Rated Building Guidelines. Significantly remodeled homes include remodels of 50 percent or more of the square footage or wall area of the home, and addition as of 50 percent or more of the square footage or wall area of the home.	The four residential units would be subject to A&S review, and each applicant would be required to complete a GreenPoint Rated checklist.
GB-3 Incentives for Green Building Certification. Allow greater flexibility and other incentives (e.g., permitting-related) for LEED Silver certification or equivalent GreenPoint rating, for example, by giving green projects priority in plan review and processing.	The Town has not yet developed incentives for Green Building Certification. Depending on the relative timing of development of these incentives, priority plan review and processing incentives may be in place at the time homes are proposed for construction and would be followed by the Town.
GB-4: Solar Orientation. Require measures that reduce energy use through solar orientation by taking advantage of shade, prevailing winds, landscaping, and sun screens.	Project homes would be subject to A&S review, and each applicant would be required to demonstrate that appropriate solar orientation has been incorporated into the designs.
RE-5 Solar Ready Features. Where feasible, require that all new buildings be constructed to allow for the easy, cost effective installation of future solar energy systems. "Solar Ready" features should include: proper solar orientation (i.e., south facing roof area sloped at 20° to 55° from the horizontal); clear access on the south sloped roof (i.e., no chimneys, heating vents, or plumbing vents); electrical conduit installed for solar electric system wiring; plumbing installed for hot water system; and space provided for a solar hot water storage tank.	Residences constructed on the project site would be subject to A&S review, and each applicant would be required to incorporate solar ready features into the home design, where feasible.
EC-1: Energy-Efficient Appliances and Lighting. Require new development to use energy-efficient appliances that meet ENERGY STAR standards and energy-efficient lighting technologies that exceed Title 24 standards by 30%.	Project homes would be subject to A&S review, and each applicant would be required to complete a GreenPoint Rated checklist for the proposed home design, which includes consideration of energy conservation measures.
EC-3: Energy-Efficient Outdoor Lighting. Require outdoor lighting fixtures to be energy-efficient. Require parking lot light fixtures and light fixtures on buildings to be on full cut-off fixtures, except emergency exit or safety lighting, and all permanently installed exterior lighting shall be controlled by either a photocell or an astronomical time switch. Prohibit continuous all night outdoor lighting in construction sites unless required for security reasons.	Project homes would be subject to A&S review, and each applicant would be required to incorporate energy-efficient outdoor lighting and adhere to construction lighting best management practices.

GHG Emissions Reduction Measures	Project Compliance
WW-1: Water Use and Efficiency Requirements. For new development, require all water use and efficiency measures identified as voluntary in the California Green Building Standards Code, and consider more stringent targets. California Green Building Standards Code requirements include: 1) reduce indoor potable water use by 20 percent after meeting the Energy Policy Act of 1992 fixture performance requirements, and 2) reduce outdoor potable water use by 50 percent from a calibrated mid-summer baseline case, for example, through irrigation efficiency, plant species, recycled wastewater, and captured rainwater. Establish Town requirements for discretionary projects regarding watering timing, water-efficient irrigation equipment, water-efficient fixtures, and offsetting demand so that there is no net increase in imported water use. Include clear parameters for integrating water conservation infrastructure and technologies, including low-flush toilets and low-flow showerheads. As appropriate, partner with local water conservation companies on the development and implementation of this measure.	Prior to issuance of building permits, project homes would be reviewed for compliance with all applicable CALGreen water use and efficiency measures. If the Town establishes additional new requirements in excess of CALGreen requirements prior to receiving an application to construct a residence on the project site, then the applicant would be required to comply with those additional requirements, as well.
WW-3: Bay Friendly Landscaping. Require new development to use native plants or other appropriate non-invasive plants that are drought-tolerant, as described in the Bay Friendly Landscaping Guidelines, available at StopWaste.org and BayFriendlyCoalition.org.	Project implementation would include landscape plantings along project roads as well as the northwestern and northern project boundaries. Project homes would be subject to A&S review, and each landscaping plan would be required to include native plants or other appropriate non-invasive, drought-tolerant plants.
SW-1: Construction Waste Diversion. Revise the existing construction and demolition ordinance to require at least 50 percent diversion (i.e. reuse or recycling) of non-hazardous construction waste from disposal.	The project applicant would be required to divert 50 percent of construction waste for reuse or recycling.

Source: Town of Los Gatos, 2012 and Kimley-Horn and Associates, 2016.

Source(s)

BAAQMD. 2009. Revised Draft Guidelines and Justification Report.

Town of Los Gatos. 2012. Los Gatos Sustainability Plan. Available online: http://www.town.los-gatos.ca.us/DocumentCenter/View/8162.

Hazards and Hazardous Materials

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
8. HAZARDS AND HAZARDOUS MATERIALS. Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?			X	
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?			X	
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within ¼ mile of an existing or proposed school?				X
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?				X
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?				X
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?				X
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?			X	
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?		X		

(a–d) Exposure to hazardous materials

Based upon a search of the Department of Toxic Substances Control's EnviroStor, the project site is not located within one mile of a known cleanup site or other hazardous materials site (DTSC, 2015). According to the State Water Resources Control Board's Geotracker, there are no leaking underground storage tanks (LUSTs) within a quarter-mile of the project site. Three LUSTs are located approximately half a mile from the project site, on Francis Oaks Way, Las Flores Lane, and Diduca Way. All of these locations are downgradient of the project site, and all cases have been closed, meaning that corrective actions have been completed and No Further Action letters have been issued by the County of Santa Clara Department of Environmental Health or the Santa Clara Valley Water District. Therefore, the project site is not located on or in proximity to Hazardous Wastes and Substances Sites List such that significant impacts related to hazardous materials would result.

The construction of the proposed project would require heavy equipment for earthwork activities as well as hazardous materials, including fuels, oils, solvents, glues and others. If not managed appropriately, construction activities could potentially expose construction workers or the environment to hazardous materials through inappropriate use, storage, handling, or disposal. Heavy equipment could require on-site refueling, which could also result in inadvertent releases either through poor management or upset and accidental conditions. However, project construction would require adherence to the National Pollutant Discharge Elimination System (NPDES) Construction General Permit, which would necessitate the preparation and implementation of a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP would include best management practices that cover the transport, use, and disposal of any hazardous materials used during construction that minimize the potential exposure to workers, the public, and the environment, as well as the potential for upset and accidental release conditions.

Regarding operations, the proposed project's residential uses may involve use and storage of some materials that are considered hazardous, although these materials are typically limited to everyday use solvents, paints, chemicals used for cleaning and building maintenance, and landscaping supplies. These materials would not be substantially different from household chemicals and solvents already in use throughout the town. Household hazardous wastes may be disposed of at one of the Santa Clara County household hazardous waste facilities by making and appointment with the County of Santa Clara Household Hazardous Waste program.

Regarding schools, the project site is not located within one-quarter mile of an existing school, so there would be no impact related to release of hazardous materials in proximity to schools.

(e–f) Proximity to a public or private airport

The project site is not located in proximity to a public or private airport or within the boundaries of an Airport Land Use Plan. Norman Y. Mineta San Jose International Airport and Reid Hillview Airport are located more than 13 miles to the north.

(g) Impair implementation of an emergency response plan or emergency evacuation plan

The project site is not located within the area of or within the direct vicinity of an emergency response plan or emergency evacuation plan. The proposed project would result in the extension of a publicly accessible roadway to the project site from Shady Land, and secondary and emergency access would continue to be available via Shannon Road. Therefore, the impact associated with emergency response would be less than significant.

(h) Expose people or structures to wildland fires

The project site is located in an area designated as Very High Fire Hazard Severity Zone by CalFIRE (2008). The project site is located on a crest or ridge, and conceptual building envelopes are located on the ridge because slopes are too steep below the ridge. Plans for development of each lot would be reviewed by the Town during the A&S review process to ensure that the homes would be constructed within the Least Restrictive Development Areas (LRDA), which include slopes of less than 30 percent and areas that are not densely wooded. Also during A&S review, the proposed landscaping plan would be reviewed by the Santa Clara County Fire Department and Town staff for consistency with the Hillside Development Standards and Guidelines (2004) related to use of appropriate plants, maintenance of an adequate defensible space, and guidelines to prevent fire hazards. The following standards would apply:

- *Building locations shall minimize exposure to wildfires.*
- *A landscape plan shall be provided and will be reviewed by the Town staff for consistency with the Fire Department's recommended plant list. The landscape plan shall create defensible space around the home, and if there is a fire ladder on the property, it shall be eliminated in an environmentally sensitive manner.*
- *Development shall have adequate fire access.*
- *A dependable and adequate water supply for fire protection and suppression purposes, as required by the Santa Clara County Fire Department, shall be provided for all properties.*
- *Water for fire suppression shall be available and labeled before any framing may begin.*

The Hillside Development Standards and Guidelines also provide the following guidelines for reducing fire hazards:

- *Development should avoid areas subject to severe fire danger. In order to achieve this, development should be set back from the crest of a hill, not be located on or adjacent to slopes greater than 30 percent, and not be located within densely wooded areas. If this is not possible, measures designed to assure the highest degree of fire prevention and fast effective means of evacuation and fire suppression shall be provided.*
- *The fuel load within a defensible space should be minimized by use of selective pruning, thinning and clearing as follows: removal of flammable species and debris, removal of dead, dying or hazardous trees, mow dead grasses, removal of dead wood from trees and shrubs, and thin tree crowns (maximum of 25 percent).*

- *Discontinuous fuel sources should be created and maintained within a defensible space through use of the following techniques: thin vegetation to form discontinuous groupings of trees or shrubs, limb trees up from the ground, and establish a separation between the lowest branches of a tree and any understory shrubs.*
- *Landscaping within a defensible space should be designed with fire safety in mind. Landscaping in defensible space should be: fire resistant and drought tolerant, predominantly low-growing shrubs and groundcovers (limit shrubs to 30 percent coverage), limited near foundations (height and density).*

Grasses are currently mowed, and defensible space would be maintained pursuant to California Public Resources Code Section 4291. Mitigation Measure HAZ-1 is identified to ensure that the potential for wildland grass fires would be minimized with the proposed project. A&S review and implementation of this measure would ensure that wildland fire hazards would be less than significant.

Mitigation Measures – Hazards and Hazardous Materials (HAZ)

Mitigation Measure HAZ-1: Fire Safety Plan During Construction

The contractors for the proposed project and future residential development shall prepare and implement fire safety plans for construction operations to prevent and respond to fire. The plan shall state that construction equipment be equipped with fire prevention devices (e.g., spark arrestors) pursuant to Public Resources Code 4442. Water and firefighting tools (e.g. shovels, axes, fire extinguishers) shall be maintained on site during construction activities. The plan shall be reviewed and approved by the Town of Los Gatos prior to issuance of demolition, grading, or building permits.

Source(s)

Cal FIRE. 2008. Santa Clara County Very High Fire Hazard Severity Zones in Local Responsibility Areas as Recommended by Cal FIRE. Available online: http://frap.fire.ca.gov/webdata/maps/santa_clara/fhszl_map.43.pdf.

Department of Toxic Substances Control (DTSC). 2015. EnviroStor. Available online: http://www.envirostor.dtsc.ca.gov/public/. Accessed December 31st.

State Water Resources Control Board (SWRCB). 2015. GeoTracker. Available online: http://geotracker.waterboards.ca.gov/. Accessed December 31st.

Town of Los Gatos. 2004. Hillside Development Standards & Guidelines. Available online: http://www.losgatosca.gov/1117/Hillside-Development-Standards-Guideline.

Hydrology and Water Quality

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
9. HYDROLOGY AND WATER QUALITY. Would the project:				
a) Violate any water quality standards or waste discharge requirements?			X	
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local ground water table level (for example, the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?			X	
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site.			X	
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site.			X	
e) Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?			X	
f) Otherwise substantially degrade water quality?			X	
g) Place housing within a 100-year flood-hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?			X	
h) Place within a 100-year flood-hazard area structures which would impede or redirect flood flows?				X
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?				X

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
j) Inundation by seiche, tsunami, or mudflow?				X

(a) Violate water quality or waste discharge requirements

Construction

For project construction activities, projects which disturb one or more acres of soil or projects which disturb less than one acre but are part of a larger common plan of development that in total disturbs one or more acres, are required to obtain coverage under the General Permit for Discharges of Storm Water Associated with Construction Activity (Construction General Permit, 99-08-DWQ). Construction activity subject to this permit includes clearing, grading and disturbances to the ground (e.g., stockpiling or excavation). The permit does not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility. While the proposed project may disturb slightly less than one acre of soil, the project does include future development of four single-family residences and is part of a larger common plan of development. Consequently, construction activities for the proposed project would be subject to the provisions of the Construction General Permit.

A Notice of Intent must be filed with the Regional Water Quality Control Board (RWQCB), and the Construction General Permit requires that a Storm Water Pollution Prevention Plan (SWPPP) be prepared. The SWPPP must be consistent with the terms of the Santa Clara Valley Urban Runoff Pollution Prevention Program's recommended best management practices (BMPs) for construction activities. In addition, pursuant to Town of Los Gatos Code Section 12.20.050, an erosion and sediment control plan shall be required whenever the graded portion of a site includes more than 10,000 square feet having a slope greater than 5 percent. The plan would include an effective revegetation program to stabilize all disturbed areas which will not be otherwise protected. The plan shall include measures to prevent increased discharge of sediment at all stages of grading and development from initial disturbance of the ground to project completion. Therefore, with adherence to existing Statewide and local regulations, erosion impacts would be less than significant.

The Municipal Regional Permit (MRP) was adopted in October 2009 (amended November 28, 2011) and governs discharges from municipal storm drains operated by 76 local government entities, including those in Los Gatos. Pursuant to MRP Provision C.3.c.i(2)(a), the SWPPP and erosion and sediment control plans would include erosion-control best management practices that would be expected to protect exposed soils from potential erosional forces. These erosion control measures may include: 1) a stabilized construction entrance/exit; 2) storm drain inlet

protection; 3) building pad protection; 4) installation of fiber rolls; and 5) hydroseeding of disturbed areas) which would reduce potential erosion hazards to a less-than-significant level.

Operation

The Town of Los Gatos is a co-permittee under the National Pollution Discharge Elimination System (NPDES) permit program implemented by the California Regional Water Quality Control Board for the San Francisco Bay Region.

MRP Provision C.3, New and Redevelopment Performance Standards, of Order No. R2-2009-0074 of the MRP requires site designs for new developments and redevelopments to minimize the area of new roofs and paving. The MRP also includes Site Design and Stormwater Treatment Requirements. Where feasible, pervious surfaces should be used instead of paving so that runoff can infiltrate to the underlying soil. Remaining runoff from impervious areas must be captured and used or treated using bioretention. In some developments, the rates and durations of site runoff must also be controlled. In addition, project applicants must execute agreements to allow municipalities to verify that stormwater treatment and flow-control facilities are maintained in perpetuity.

Pursuant to MRP Provision C.3.ii, the Town would require each residential unit constructed under the proposed project to implement at least one of six specified Low Impact Development (LID) Site Design measures. These include the following measures:

- Direct roof runoff into cisterns or rain barrels for reuse;
- Direct runoff onto vegetated areas;
- Direct runoff from sidewalks, walkways, and/or patios onto vegetated areas;
- Direct runoff from driveways and/or uncovered parking lots onto vegetated areas;
- Construct sidewalks, walkways, and/or patios with permeable surfaces;
- Construct bike lanes, driveways, and/or uncovered parking lots with permeable surfaces.

The incorporation of these stormwater treatment measures as required by the Town would reduce the project's potential effects on stormwater quality to a less-than-significant level.

(b) Substantially deplete or interfere with groundwater supplies

All water used on the project site would be from the local public water supply provided by the San Jose Water Company, which consists of both surface water and groundwater. There are no existing groundwater wells on the property and none are proposed. Therefore, the project would have a less-than-significant impact on groundwater depletion beyond any impacts associated with the provision of water by the San Jose Water Company and the agencies from which it directly or indirectly receives water, including the Santa Clara Valley Water District, the U.S. Bureau of Reclamation, and the California Department of Water Resources. The project would result in increased impervious surfaces, but not to the extent that groundwater recharge would be precluded. The impact would be less than significant.

(c–f) Substantially alter existing drainage patterns, exceed runoff capacity, or degrade water quality

The 13-acre project site is currently developed with a single-family residence, guest cottage (without kitchen), pool and deck, tennis court, five sheds (including a horse run), stables, horse arena, breaking ring, and paved drive. The existing house and associated outbuildings encompass approximately 15,500 square feet of impervious surfaces, while the property's private drive and walkways cover approximately 0.5 acre or 24,200 square feet of the site. Other facilities such as swimming pool, tennis court, and hardscape provide an additional 5,870 square feet of impervious surfaces throughout the site. Total impervious surfaces currently on the project site total approximately 45,540 square feet, or 8 percent of the 13-acre parcel. Pervious surfaces on the project site primarily consist of open space and landscaping extending over approximately 522,800 square feet of the site.

The proposed project would result in development of approximately 41,000 square feet of impervious surfaces for the public roadway extension and private driveway on the site. The project would also add approximately with 25,600 square feet of impervious surfaces for the four new residences. While general locations of future homes on respective lots are identified for each lot, the project plans do not include specific information concerning collection, treatment, and disposal of stormwater flows from project residences. As a result, the project would provide 74,479 square feet of new impervious surfaces on the site. This net increase in impervious surfaces would generate additional stormwater runoff beyond existing conditions.

A Conceptual Stormwater Control Plan was prepared for the proposed project to address anticipated storm runoff flows from the proposed access roadway and future residential lots. To collect and treat surface water runoff, all treatment control facilities at the proposed site are designed to infiltrate into the native soil. This would be accomplished by constructing a series of infiltration trenches. There would be a minimum of two trenches at each of the proposed lots, and one trench at each side of the proposed roadway. The trenches at the residential lots are placed as close to the houses and driveways as possible to limit the amount of pervious runoff that will flow into the trench, which may otherwise cause overflow. The proposed trench on the north side of the roadway is used to infiltrate the runoff from the roadway itself.

As stated under item (a), above, the proposed project's storm drainage design would incorporate one or more measures to ensure the control and retention of storm runoff on the project site and preclude increased, untreated runoff discharges. Consequently, generation of increased storm runoff by the project would have a less-than-significant impact.

(g–i) Flood hazard

According to the 2020 Los Gatos General Plan, the project site is not within the 100-year floodplain. The Flood Insurance Rate Map for the project area indicates that the project site is in Zone D, areas in which flood hazards are undetermined, but possible. The project site is located on the top of a ridge, at elevations between 670 and 850 above mean sea level (msl).

Additionally, there are no natural drainages on the project site. Consequently, no significant flood hazard impacts would be anticipated.

(j) Inundation by seiche, tsunami, or mudflow

The project site is located at an elevation of approximately 700 to 800 feet msl, more than 13.5 miles south of the San Francisco Bay shoreline; therefore, there would be no risk associated with tsunamis, which are large sea waves. Seiches are standing waves caused by large-scale, short-duration phenomena (e.g. wind or atmospheric variations or seismic activity) that result from the oscillation of confined bodies of water (such as reservoirs and lakes) that may damage low-lying adjacent areas as a result of changes in the surface water elevation. The project site would not be subject to a seiche because the nearest large water body is Vasona Reservoir, located approximately 2.2 miles to the west. The project site is at the top of a ridge and would not be subject to mudflow. Impacts related to erosion are discussed above. Therefore, there would be no impact related to exposure of people or structures to significant risk of loss, injury, or death involving seiche, tsunami, or mudflow.

Land Use and Planning

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
10. LAND USE AND PLANNING. Would the project:				
a) Physically divide an established community?				X
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?			X	
c) Conflict with any applicable Habitat Conservation Plan or Natural Community Conservation Plan?				X

(a) Physically divide an established community

The proposed project would not include construction of a physical barrier (e.g., a freeway, levee, or railroad track) that would physically divide the existing neighborhoods surrounding the project site. To the contrary, development of the proposed project site would extend a publicly accessible roadway from Shady Lane westward to a cul-de-sac south of the existing on-site residence. In addition, the project would provide a trail easement from the northern to the

southern project boundary along the existing paved access drive that traverses the project site. The existing project site driveway would be maintained for secondary access and emergency access. As such, the project would not physically divide an established community. There would be no impact.

(b) Consistency with land use plan or policy

General Plan

The Los Gatos 2020 General Plan (adopted 2010) designates the project site as Hillside Residential. This designation allows for residential uses at densities of 0 to 1 unit per acre. The project would result in five residential units over 13 acres, which would be consistent with this density. The project would be generally consistent with the 2020 General Plan.

Hillside Specific Plan

The project site also falls within the Blossom Hill Sub-Area (Sub-Area 1) of the Hillside Specific Plan (adopted 1978). Development in the Hillside Specific Plan area is prohibited outside of designated "least restrictive development areas" (LRDAs) unless it is compliant with conditions established in the Plan. The Blossom Hill Sub-Area is noted as the area that should receive special emphasis for future annexations, and the ultimate density of the sub-area should be between 2.5 and 10 acres per dwelling, with a minimum lot size of 1 acre. The project would be generally consistent with the Hillside Specific Plan.

Zoning

The Town has pre-zoned the project site as HR-5 (Hillside Residential, 5-acre minimum lot size). The project applicant proposes to annex the 13-acre property into the Town and rezone the property to HR-2½:PD. The HR-2.5 zone would allow subdivision of the project parcel into five 2.59-acre lots. The PD overlay zone would set development standards and ensure that the four houses built on the project site would be consistent with the zoning and General Plan.

(c) Conflict with any applicable habitat conservation plan or natural community conservation plan

There is no adopted habitat conservation plan or natural community conservation plan applicable to the project site. Therefore, the proposed project would not conflict with any approved local, regional, or state habitat conservation plan, and there would be no impact.

Source(s)

Town of Los Gatos. 2010. 2020 General Plan. September 20.

Town of Los Gatos. 1978. Hillside Specific Plan. Available online: http://www.losgatosca.gov/1146/Los-Gatos-Hillside-Specific-Plan.

Mineral Resources

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
11. MINERAL RESOURCES. Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?				X
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?				X

(a–b) Loss of availability of a known mineral resource or locally-important mineral resource recovery site

The Los Gatos General Plan does not identify any regionally or locally-important mineral resources on the project site or in its vicinity. The General Plan Open Space, Parks, and Recreation Element specifically states that mineral sources production areas are "not applicable to Los Gatos." As such, there are no locally-important mineral resource recovery sites in the project site vicinity, and the project would have no impact to these resources. (Town of Los Gatos, 2010).

Source(s)

Town of Los Gatos. 2010. 2020 General Plan. September 20.

Noise

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
12. NOISE. Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance or applicable standards of other agencies?			X	

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
b) Exposure of persons to or generation of excessive ground borne vibration or ground borne noise levels?			X	
c) Substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?			X	
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?		X		
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?				X
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?				X

(a, c) Exposure to, or generation of, permanent noise

The project site is in a rural noise environment with no major noise sources. Therefore, compatibility with existing noise would not be an issue. The proposed four single-family residences would result in increased noise associated with residential use, such as operation of appliances and landscaping equipment. These noises would be similar to the noise generated at nearby residences and would not conflict with the existing noise environment.

Regarding traffic noise, as indicated in the 2020 Los Gatos General Plan, the weighted average sound during a 24-hour period (known as the community equivalent noise level, [CNEL]) in the project site vicinity would be less than 60 dBA at General Plan buildout, and traffic noise would primarily be a concern in proximity to major arterials through the town. The net addition of four units would incrementally increase traffic noise on Santella Drive and Shady Lane. These traffic increases would be minor, however, and not to the extent that the General Plan's outdoor residential day-night noise level (Ldn, similar to CNEL) standards of 55 dBA Ldn at 100 feet would be exceeded.

(b) Exposure to ground borne vibration or ground borne vibration

There are no adopted state or local policies for groundborne noise or vibration. The federal transit administration (FTA) states that non-engineered timber and masonry buildings can be expose to groundborne vibration levels of up to 0.2 inches per second (in/sec) without experiencing structural damage. Construction of the project features could involve the use of bulldozers and vibratory rollers, which may result in vibration of up to 0.089 in/sec and 0.210 in/sec, respectively, at 25 feet (FTA, 2006). Given existing residences, including the on-site residence, are located at least 60 feet from potential vibration-generating construction activities, these vibration levels would dissipate below the 0.2 in/sec threshold at the receptor.

(d) Substantial temporary noise increase

The Town of Los Gatos Municipal Code Chapter 16 restricts construction activities to the hours of 8:00 a.m. to 8:00 p.m. on weekdays and 9:00 a.m. to 7:00 p.m. on weekends and holidays. Construction noise is limited to 85 dBA at the property line (or 85 dBA at 25 feet if the activity occurs near the property line).

Construction noise would range from approximately 74 to 89 dBA at 50 feet, depending on the types of equipment that would be used in project construction (FTA, 2006). As such, without the use of acoustic shield or other noise-reduction measures, construction equipment would exceed the Town of Los Gatos noise standards. Consistency with the noise standards would be ensured through implementation of Mitigation Measure NOI-1.

(e–f) Excessive noise level near a public or private airport

The project site is not located in proximity to a public or private airport. There would be no impact related to airport noise.

Mitigation Measures – Noise (NOI)

Mitigation Measure NOI-1: Construction Specifications to Reduce Noise

The project applicant and its successors shall ensure that the following practices are incorporated into the construction specification documents to be implemented by the project contractor:

- Provide enclosures and mufflers for stationary equipment, shrouding or shielding for impact tools, and barriers around particularly noisy operations, such as grading or use of concrete saws within 50 feet of an occupied sensitive land use.
- Use construction equipment with lower (less than 70 dB) noise emission ratings whenever possible, particularly air compressors and generators.
- Do not use equipment on which sound-control devices provided by the manufacturer have been altered to reduce noise control.
- Locate stationary equipment, material stockpiles, and vehicle staging areas as far as practicable from sensitive receptors.
- Prohibit unnecessary idling of internal combustion engines.

- Implement noise attenuation measures to the extent feasible (i.e., such that they do not impede efficient operation of equipment or dramatically slow production rates), which may include, but are not limited to, noise barriers or noise blankets. The placement of such attenuation measures shall be reviewed and approved by the Los Gatos Building Division prior to issuance of development permit for construction activities.

Source(s)

Federal Transit Administration, *Transit Noise and Vibration Impact Assessment,* available online: http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf, May 2006.

Town of Los Gatos. 2010. 2020 General Plan. September 20.

Population and Housing

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
13. POPULATION AND HOUSING. Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?			X	
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?				X
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?				X

(a) Population growth

The Town of Los Gatos currently has a population of approximately 30,735 (U.S. Census, 2014). According to the 2020 General Plan, the population is expected to increase to 32,600 by 2020 (Town of Los Gatos, 2010).

Based upon the Los Gatos-average 2.36 residents per household, the proposed project's four net residential units would result 10 new residents. These 10 residents would not represent substantial population growth that would exceed the planned population increase by 2020. Therefore, the project would not directly induce substantial population growth.

Indirect population growth may be induced by the extension of infrastructure—such as roadways, water service, wastewater service, and other utilities—into greenfield or undeveloped areas. The proposed project would result in the extension of Santella Drive as a public roadway through the parcel immediately north of the project site. This parcel, however, already contains private driveways that connect to the existing Santella Drive. As such, the extension of Santella Drive through the southwest corner of this parcel would not indirectly induce substantial development or population growth.

The annexation of the proposed project site could result in five additional houses within the Town of Los Gatos. The 2020 General Plan designates the project site as Hillside Residential. This designation allows for residential uses at densities of 0 to 1 unit per acre. The project would result in five residential units over 13 acres, which would be consistent with this density.

Therefore, the addition five additional residences within the Town Limits would not create significant adverse impacts with regard to an increased population because the proposed project is consistent with the General Plan residential buildout for this area. The addition of the five single-family residential units would not create a significant increase in population demands for public services or utilities because approximately 13 people (2.36 average household size x 5 houses) would be added as new residents within the City. This amount of new people is within the Town of Los Gatos 2020 General Plan growth projections. Furthermore, the annexation of the project site into the Town of Los Gatos would not result new growth in the surrounding area, because the project is not extending infrastructure (e.g., roads, water, sewer) into an area that was previously lacking these services and the lack of services was hindering growth. Therefore, potential impacts on population growth and induced growth are considered to be less than significant.

(b–c) Housing and resident displacement

The proposed project would retain the one existing residence on the project site. The project would not displace any people or housing units. The project would result in the construction of new housing.

Source(s)

Town of Los Gatos. 2010. 2020 General Plan. September 20.

Public Services

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
14. PUBLIC SERVICES. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities or need for new or physical altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:				
a) Fire protection?			X	
b) Police protection?			X	
c) Schools?			X	
d) Parks?			X	
e) Other public facilities?			X	

(a–e) Fire, police, schools, parks and other public facilities

Services are currently provided to the project site's existing residence as well as other residences in the project vicinity. The Los Gatos / Monte Sereno Police Department and the Santa Clara County Fire Department would provide emergency and public safety services to the project site. The project's four residential units would not substantially increase demand for these services such that new or expanded fire or police protection services would be required.

The Santa Clara County Fire Department provides fire protection services to the project area has indicated that it would review construction plans. The Department has undertaken a preliminary review of the proposed project with respect to site access and water supply as they pertain to fire department operations. The Department indicated that the proposed project appears to be consistent with Fire Department requirements (SCCFD, 2015). The Fire Department would review the final detailed design of the proposed roadway to ensure it would allow fire protection service.

Based on an average student yield factor of 0.386 per unit, the project would add approximately two new students to the Los Gatos Union School District, which encompasses grades K through 8. The District has grown from 2,587 students in the 2006–2007 school year to 3,345 students in the 2014–2015 school year, primarily caused by net migration of families with school-aged children (and not by new housing units) (LGUSD, 2015).

Based on an average student yield factor of 0.208 per unit, the project would add 1 student to the Los Gatos-Saratoga Joint Union High School District (Los Gatos, 2012). The District has grown from 3,153 students in the 2010 – 2011 school year to 3,302 students in the 2014 – 2015 school year (Ed-Data, 2016).

Students associated with the proposed project would contribute to the cumulative demand for educational services and result in enrollments that exceed current district capacities.

The proposed project would be required by law to pay development impact fees to each school district at the time of the building permit issuance. These fees are used by the school districts to mitigate impacts associated with long-term operation and maintenance of school facilities with new development in accordance with State law. Pursuant to Section 65996(3)(h) of the California Government Code, payment of these fees "is deemed to be full and complete mitigation of impacts of any legislative or adjudicative act, or both, involving but not limited to, the planning, use, or development of real property, or any change in government organization or reorganization." Any secondary environmental impacts resulting from the construction of new schools would be analyzed by each School District prior to construction of any new schools. The three new students associated with the project would not drive the need for any such new construction. Therefore, with payment of development impact fees to each school district as required by law, the project's impact on the schools attended by project students would be less than significant.

Impacts to parks are analyzed under "Recreation," below.

Source(s)

Education Data Partnership (Ed-Data). 2016. Los Gatos-Saratoga Joint Union High web page: http://www.ed-data.org/district/Santa-Clara/Los-Gatos--Saratoga-Joint-Union-High, accessed January 2, 2016.

Los Gatos. 2012. Memorandum: North 40 Advisory Committee Meeting Report. Community Development Department. August 17.

LGUSD. 2015. Framework & Positioning for Overcrowding. Draft. March 10.

Santa Clara County Fire Department (SCCFD). 2015. Development Review Comments: 15 0776.

Recreation

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
15. RECREATION. Would the project:				

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?			X	
b) Include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?			X	

(a) Increase the use of existing recreation facilities

As stated above under Population and Housing, the proposed project would result in approximately 10 new residents in the Town of Los Gatos. Recreational space for these 10 residents would be provide in private yards at the 4 residences. Although it is possible that these residents could use existing recreational facilities in the Town of Los Gatos, their use would not be so substantial as to accelerate the physical deterioration of those facilities.

(b) Include recreational facilities or the construction or expansion of recreational facilities

As stated in the Project Description, the project would result in the designation of a trail easement extending from the current project site driveway westward through Lots 2 and 3 to the Santella Drive extension. In addition, the project would result in the designation of a private common area easement over the existing horse arena. As such, the project would result in the provision of new recreational facilities. Given the horse arena is an existing use, and given that no construction is proposed along the proposed trail easement, there would be no impacts associated with the project's recreational facilities.

Transportation/Traffic

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
16. TRANSPORTATION/TRAFFIC. Would the project:				
a) Conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?			X	
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?			X	
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?				X
d) Substantially increase hazards due to a design feature (for example, sharp curves or dangerous intersections) or incompatible uses (for example, farm equipment)?		X		
e) Result in inadequate emergency access?			X	
f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?			X	

(a–b, f) Conflict with applicable transportation plans or ordinances, including congestion management plans

In accordance with the Town of Los Gatos revised Traffic Impact Policy (approved August 19, 2014), projects that would generate 20 or more new peak-hour trips are required to complete a comprehensive traffic impact analysis report. Trip generation rates are based upon the most recent edition of the Institute of Traffic Engineers (ITE) *Trip Generation Manal*. Using those rates, the proposed project's four net residential units would result in 3 trips in the AM peak

hour and 4 trips in the PM peak hour, both of which are below the standards established in the Town's Traffic Impact Policy. These net new peak hour trips would not substantially affect traffic operations or conflict with the Santa Clara Valley Transportation Authority (VTA) 2013 Congestion Management Program.

Due to the rural residential, agricultural, and open space character of the project site vicinity, the project site is not located in an area served by mass transit or conducive to daily commute trips by walking or bicycle. Given the project's small size and limited trip generation, the project would not conflict with plans related to alternative transportation modes.

(c) Change in air traffic patterns

The proposed project would not result in a change in air traffic patterns. The nearest airport, Mineta San José International Airport, is located approximately nine miles to the north. There would be no impact.

(d) Substantially increase hazards due to a design feature

Construction. To accommodate the proposed houses, roadway and driveways, a net total 500 cubic yards would be excavated and hauled from the site. Export of 500 cubic yards of material off-site could generate up to 42 truckloads or a total of 84 one-way truck trips (assuming 12 cubic yards per haul truck). Pursuant to Mitigation Measure TRANS-1, the project applicant would be required to work with the Engineering Division of the Parks and Public Works Department to devise a traffic control plan to ensure safe and efficient traffic flow during periods when soil is hauled. Potential safety hazards during project construction would be less than significant with mitigation.

Road Design and Grades. The proposed private shared access drive and cul-de-sac would be 20 feet wide and would not include on-street parking. Sections of the proposed private street are proposed with grades that exceed 15 percent; two sections (that are 250 feet in length) would have grades of up to 20 percent. The project applicant is requesting an exception to the HDS&G for these steeper sections of the private drive. The Santa Clara County Fire Department has reviewed the site access and did not indicate any concerns with the proposed road grades (a less-than-significant impact) (SCCFD, 2015). The Fire Department would review the final detailed design of the proposed roadway to ensure it would allow fire protection service.

(e) Result in inadequate emergency access

The proposed Santella Drive extension would provide primary access to the project site. The existing driveway from Shannon Road would provide secondary emergency access. Therefore, the proposed project would not result in inadequate emergency access. There would be no impact.

Mitigation Measures – Transportation and Circulation (TRANS)

Mitigation Measure TRANS-1: Traffic Control Plan

The project applicant shall work with the Engineering Division of the Town of Los Gatos's Parks and Public Works Department to devise a traffic control plan for incorporation into the construction bid documents (specifications) to ensure safe and efficient traffic flow during periods when soil is hauled off the project site. The plan shall include, but not be limited to, the following measures:

- Hauling and delivery activities and designated truck routes shall be strategically selected, timed and coordinated to minimize traffic disruption to schools, residents, businesses, special events, and other projects in the area. The schools located on the haul route shall be contacted to help with the coordination of the trucking operation to minimize traffic disruption.
- Flag persons shall be placed at locations as necessary. All flag persons shall have the capability of communicating with each other to coordinate the operation.
- Prior to construction, advance notification of all affected residents and emergency services shall be made regarding one-way operation, specifying dates and hours of operation.
- Hauling of soil on or off-site shall not occur during the morning or evening peak periods (between 7:00 a.m. and 9:00 a.m. and between 4:00 p.m. and 6:00 p.m.).

Source(s)

Santa Clara County Fire Department (SCCFD). 2015. Development Review Comments: Review of a proposed revision of the Fire Department access for a proposed 5-lot development in the Wildland-Urban Interface Area. March 20.

Utilities and Service Systems

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
17. UTILITIES AND SERVICE SYSTEMS. Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?			X	
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction or which could cause significant environmental effects?			X	

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?			X	
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?			X	
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project-projected demand in addition to the provider's existing commitments?			X	
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?			X	
g) Comply with federal, state, and local statutes and regulations related to solid waste?			X	

The existing residence is currently served by a water main that extends from the southwest corner of the site, along the southern property boundary, and then turns north to the house. The home is currently served by a septic tank located near the northern property boundary.

(a) Wastewater capacity

Sanitary sewer service would be provided by West Valley Sanitation District (WVSD) upon annexation to the Town and the District. The WVSD provides wastewater collection to an area of approximately 30 square miles and 109,000 people. Wastewater is collected and transported to the San Jose-Santa Clara Regional Wastewater Facility (RWF). The RWF treats an average of 110 million gallons per day (mgd) of wastewater, approximately 13 percent of which goes to the adjacent South Bay Water Recycling pump station (RWF, 2014). The facility is permitted to treat up to 167 mgd, pursuant to its National Pollution Discharge Elimination System (NPDES) permit (RWQCB, 2014). As indicated under item (d) below, conservatively assuming the proposed project would result in water demand of 144 gallons per person per day, and all of that water exits the project site as wastewater, the proposed project would result in the proposed project would result in 1,440 gallons of wastewater per day. This

increased wastewater flow would be accommodated within the excess ADWF of the RWF. The impact would be less than significant.

As such, annexation into the WVSD would not result in a substantial increase in the amount of wastewater treated at the San Jose-Santa Clara RWF. Annexation into the district and connecting to the existing sewer main located in Santella Drive would not remove a barrier to growth (i.e., additional subdivisions) to surrounding properties because sewer service is available at this project site. The proposed sewer infrastructure at the project site would be constructed only to serve the proposed project and no offsite sewer connection or sewer line points of connection at the property line are proposed. As such annexation into the WVSD would not result in a substantial growth within the district or result in a substantial increase in the demand for sewer line capacity or wastewater treatment plant capacity and potential impacts associated with the annexation are considered less than significant.

(b, e) Wastewater and water treatment

With project implementation, water service would be provided by San Jose Water Company (SJWC). Water service would be provided via a water main, which would extend from the existing water tank to the north and connect to project lots via the proposed shared access drive and existing driveway. The existing water line on the property would be abandoned in place. A will-service letter has been provided by SJWC (SJWC, 2014). As further explained under item (d), below, adequate water supply exists for the project. New water treatment facilities, or an expansion of existing treatment facilities, would not be required.

As stated above, sanitary sewer service would be provided by West Valley Sanitation District (WVSD). A private on-site sanitary sewer system would include an on-site gravity system and shared pump/force main that connects to the existing WVSD sewer main at the Santella Drive/Shady Lane intersection via existing easements that extend across the properties to the west and northwest. The private sanitary sewer line would extend along the shared access drive to all five lots. A will-service letter has been provided by WVSD (WVSD, 2015). As indicated above, the project would not exceed the requirements of the San Francisco Bay RWQCB. New wastewater treatment facilities, or an expansion of existing treatment facilities, would not be required.

(c) Stormwater drainage

Storm drainage facilities are described in “Hydrology and Water Quality,” above. The environmental effects associated with construction of these facilities are encompassed within the environmental effects of construction of the entire project.

(d) Water supply

SJWC provides water approximately one million residents through supplies from groundwater production wells, imported supplies from the Santa Clara Valley Water District, and local surface water from the Santa Cruz Mountains, the last of which is provided to the Town of Los Gatos and surrounding communities. Total deliveries in 2010 were approximately 123,000 acre-feet (af) of water, of which approximately half went to single-family dwellings. In the 2010

Urban Water Management Plan, demand (based on service area Housing Elements) was projected to increase to 132,000 af by 2015 and 143,000 af by 2035. Total supplies in 2010 were 133 af, and supplies were projected to increase to 144,000 af in 2015 and 159,000 af in 2035 (SJWC, 2011).

SJWC's per capita water use is 144 gallons per person per day (gpcd), which is targeted to reduce to 111 gpd by 2020. Conservatively assuming the project's 10 residents each consume 144 gpcd, the proposed project would result in a net new demand of 525,600 gallons, or 1.61 af, per year. Assuming the residents consume 111 gpd, the proposed project would result in a net new demand of 405,150 gallons, or 1.24 af. Sufficient water supply would be available from existing entitlements to serve the proposed project.

(f–g) Adequate land fill and compliance

West Valley Collection and recycling is the Town's exclusive solid waste hauler, including for construction and demolition. Pursuant to AB 939, the Town has a per-resident disposal target of 6.0 pound per day (ppd), and an employee disposal target of 11.6 ppd. As of 2014, which is the most recent year for which data is available, the Town disposed of 3.9 ppd per resident and 7.5 ppd per employee, thereby meeting its target rates (CalRecycle, 2016a). In 2014, approximately 19,300 tons of solid waste from the Town was transported to Guadalupe Sanitary Landfill, which is the primary landfill receiving waste from the Town, and additional solid waste was dispersed among several other landfills in the region (CalRecycle, 2016b). The Guadalupe Sanitary Landfill is located in the City of San Jose. It can receive up to 3,650 tons per day of solid waste, and currently receives approximately 1,300 tons per day. The facility has 28.6 million cubic yards of capacity, of which approximately 11 million cubic yards remained in 2011. The landfill has a cease-operation date of 2048 (CalRecycle, 2016c).

The proposed project would result in a minor quantity of waste associated with demolition of some on-site structures, as well as waste associated with occupation of the four residences. Conservatively assuming a waste generation rate of 12.23 pounds per day, the four project residences would generate approximately 50 pounds of waste per day, or 9 tons per year. This waste generation would be accommodated within the permitted capacity of Guadalupe Sanitary Landfill.

West Valley Collection provides single stream recycling services, meaning that all recycling materials are placed in a single bin and do not need to be sorted by the customer. These materials are sorted at West Valley's Materials Recovery Facility in the City of San Jose. The project residents would therefore comply with waste diversion requirements and solid waste regulations, and impacts related to solid waste would be less than significant.

Source(s)

CalRecycle. 2016a. Jurisdiction Diversion/Disposal Rate Summary. Available online: http://www.calrecycle.ca.gov/LGCentral/DataTools/Reports/DivDispRtSum.htm. Accessed January 2, 2016.

CalRecycle. 2016b. Jurisdiction Disposal by Facility. Available online: http://www.calrecycle.ca.gov/lgcentral/Reports/DRS/Destination/JurDspFa.aspx. Accessed January 2, 2016.

CalRecycle. 2016c. Facility/Site Summary Details: Guadalupe Sanitary Landfill (43-AN-0015). Available online: http://www.calrecycle.ca.gov/SWFacilities/Directory/43-AN-0015/Detail. Accessed January 2, 2016.

Regional Wastewater Facility (RWF). 2014. Media Fact Sheet. Available online: https://www.sanjoseca.gov/DocumentCenter/View/34681.

San Francisco Regional Water Quality Control Board (RWQCB). 2014. Order No. R2-2014-0034, NPDES No. CA0037842.

San Jose Water Company (SJWC). 2011. 2010 Urban Water Management Plan.

SJWC. 2014. RE: Proposed 5 Lot Subdivision; 15215 Shannon Road, Los Gatos; APN 537-25-002. May 23.

West Valley Sanitation District (WVSD). 2015. RE: 15215 Shannon Road, Los Gatos (4 SFD Lot Subdivision) – Will Serve. September 11.

Mandatory Findings of Significance

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
18. MANDATORY FINDINGS OF SIGNIFICANCE. Does the project:				
a) Have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?		X		
b) Have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of the past projects, the effects of other		X		

ENVIRONMENTAL IMPACTS Issues	Potentially Significant Issues	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
current projects, and the effects of probable future projects.)				
c) Have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?		X		

(a, c) Significant Impacts on the Natural and Man-Made Environments

The potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory were considered in the response to each question in the respective sections (Sections 4 and 5) of this checklist. In addition to project specific impacts, this evaluation considered the project's potential for significant cumulative effects. There is no substantial evidence that there are biological or cultural resources that are affected or associated with this project.

The potential for adverse direct or indirect impacts to human beings were considered in the response to certain questions in sections 1. Aesthetics, 3. Air Quality, 6. Geology and Soils, 8. Hazards and Hazardous Materials, 9. Hydrology and Water Quality, 12. Noise, 13. Population and Housing, and 16. Transportation and Traffic. As a result of this evaluation, there is no substantial evidence that there are adverse effects on human beings associated with this project.

Therefore, this project has been determined not to meet these Mandatory Findings of Significance.

The proposed project would result in the following significant impacts, which would be mitigated to a less-than-significant level through implementation of identified mitigation:

- Air Quality: Projects are considered to result in a less-than-significant impact related to fugitive dust emissions through incorporation of construction dust control measures, as identified in Mitigation Measure AIR-1.
- Biological Resources: The project may affect nesting birds, bats, SFDW, and native trees. Mitigation Measures BIO-1 through BIO-4 would mitigate these impacts through implementation of preconstruction surveys, avoidance measures, and relocation for

wildlife, as well as adherence to tree removal, protection, and maintenance requirements.

- Cultural Resources: The possibility of encountering buried archaeological resources, paleontological resources, or human remains cannot be completely ruled out. Mitigation Measures CUL-1, CUL-2, and CUL-3 would mitigate potential impacts through adherence to standard procedures and regulations associated with accidental discovery.
- Geology and Soils: Impacts related to seismic events would be mitigated through preparation and adherence to design-level geotechnical reports (Mitigation Measure GEO-1).
- Hazards and Hazardous Materials: Impacts associated with accidental wildfire ignition would be mitigated through preparation and implementation of a fire safety plan during construction (Mitigation Measure HAZ-1).
- Noise: Construction noise impacts would be reduced below applicable thresholds through implementation of construction noise measures (Mitigation Measure NOI-1.)
- Transportation and Circulation: Construction traffic would be controlled through preparation and implementation of a traffic control plan for soil-hauling activities (Mitigation Measure TRANS-1).

Therefore, this project has been determined not to meet these Mandatory Findings of Significance.

(b) Cumulative Impacts

The geographic scope of cumulative impacts varies depending on impact category. Regardless, most project impacts would be confined to the project site or immediate surroundings. In general, the proposed project would result in relatively minor contributions to Town-wide or regional cumulative impacts. There are no known past, present, or reasonably foreseeable future projects that could combine with the proposed project (including identified project mitigation measures) to result in significant cumulative effects. No cumulative impacts resulting from the proposed development of four additional single family residences in combination of future remodels/additions to existing residences allowed by the Town's General Plan and Municipal Code requirements have been identified. As such, the project's contribution to cumulative effects would be less than cumulatively considerable. Therefore, this project has been determined not to meet this Mandatory Finding of Significance.

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Attachment A

Air Pollutant and Greenhouse Gas Calculations

Shannon Road

San Francisco Bay Area Air Basin, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Single Family Housing	5.00	Dwelling Unit	13.00	9,000.00	14

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2016
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	630.89	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - 13 acres 5 sf homes

Construction Phase - Grading: 20 days, Construction: 200 days, Paving: 20 days

Off-road Equipment - Grading: 1 excavator, 1 grader, 1 dozer, 2 loader/backhoes

Off-road Equipment - Construction: 1 crane, 2 forklifts, 1 gen set, 2 loader/backhoes, 1 welder

Off-road Equipment - Paving: 2 pavers, 2 paving equipment, 2 rollers

Grading - 500 CY export

Construction Off-road Equipment Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	300.00	200.00
tblConstructionPhase	NumDays	30.00	20.00
tblConstructionPhase	PhaseEndDate	1/12/2017	12/15/2016
tblConstructionPhase	PhaseEndDate	11/3/2016	11/17/2016
tblConstructionPhase	PhaseStartDate	12/16/2016	11/18/2016
tblConstructionPhase	PhaseStartDate	1/29/2016	2/12/2016
tblGrading	AcresOfGrading	10.00	75.00
tblGrading	MaterialExported	0.00	500.00
tblLandUse	LotAcreage	1.62	13.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblProjectCharacteristics	OperationalYear	2014	2016

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

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	lb/day										lb/day					
2016	16.5979	36.1631	25.0705	0.0305	10.1793	1.9610	12.1403	3.7876	1.8041	5.5917	0.0000	3,135.2642	3,135.2642	0.8438	0.0000	3,152.9845
Total	**16.5979**	**36.1631**	**25.0705**	**0.0305**	**10.1793**	**1.9610**	**12.1403**	**3.7876**	**1.8041**	**5.5917**	**0.0000**	**3,135.2642**	**3,135.2642**	**0.8438**	**0.0000**	**3,152.9845**

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	lb/day										lb/day					
2016	16.5979	36.1631	25.0705	0.0305	4.6783	1.9610	6.6393	1.7306	1.8041	3.5347	0.0000	3,135.2642	3,135.2642	0.8438	0.0000	3,152.9845
Total	**16.5979**	**36.1631**	**25.0705**	**0.0305**	**4.6783**	**1.9610**	**6.6393**	**1.7306**	**1.8041**	**3.5347**	**0.0000**	**3,135.2642**	**3,135.2642**	**0.8438**	**0.0000**	**3,152.9845**

	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**	**54.04**	**0.00**	**45.31**	**54.31**	**0.00**	**36.79**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

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	lb/day										lb/day					
Area	10.2263	0.1349	12.3812	3.7400e-003		1.6750	1.6750		1.6749	1.6749	173.1185	68.6839	241.8024	0.1304	0.0141	248.9105
Energy	5.2100e-003	0.0445	0.0190	2.8000e-004		3.6000e-003	3.6000e-003		3.6000e-003	3.6000e-003		56.8621	56.8621	1.0900e-003	1.0400e-003	57.2082
Mobile	0.1852	0.3874	1.7559	3.4900e-003	0.2389	5.2900e-003	0.2442	0.0639	4.8600e-003	0.0688		305.5133	305.5133	0.0128		305.7814
Total	**10.4168**	**0.5668**	**14.1560**	**7.5100e-003**	**0.2389**	**1.6838**	**1.9228**	**0.0639**	**1.6834**	**1.7473**	**173.1185**	**431.0594**	**604.1779**	**0.1442**	**0.0151**	**611.9001**

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	lb/day										lb/day					
Area	10.2263	0.1349	12.3812	3.7400e-003		1.6750	1.6750		1.6749	1.6749	173.1185	68.6839	241.8024	0.1304	0.0141	248.9105
Energy	5.2100e-003	0.0445	0.0190	2.8000e-004		3.6000e-003	3.6000e-003		3.6000e-003	3.6000e-003		56.8621	56.8621	1.0900e-003	1.0400e-003	57.2082
Mobile	0.1852	0.3874	1.7559	3.4900e-003	0.2389	5.2900e-003	0.2442	0.0639	4.8600e-003	0.0688		305.5133	305.5133	0.0128		305.7814
Total	**10.4168**	**0.5668**	**14.1560**	**7.5100e-003**	**0.2389**	**1.6838**	**1.9228**	**0.0639**	**1.6834**	**1.7473**	**173.1185**	**431.0594**	**604.1779**	**0.1442**	**0.0151**	**611.9001**

	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	Grading	Grading	1/1/2016	1/28/2016	5	20	
2	Building Construction	Building Construction	2/12/2016	11/17/2016	5	200	
3	Paving	Paving	11/18/2016	12/15/2016	5	20	
4	Architectural Coating	Architectural Coating	11/18/2016	12/15/2016	5	20	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 75

Acres of Paving: 0

Residential Indoor: 18,225; Residential Outdoor: 6,075; Non-Residential Indoor: 0; Non-Residential Outdoor: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Grading	Excavators	1	8.00	162	0.38
Building Construction	Cranes	1	7.00	226	0.29
Building Construction	Forklifts	2	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Paving	Pavers	2	8.00	125	0.42
Paving	Rollers	2	8.00	80	0.38
Grading	Rubber Tired Dozers	1	8.00	255	0.40
Building Construction	Tractors/Loaders/Backhoes	2	7.00	97	0.37
Grading	Graders	1	8.00	174	0.41
Grading	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Paving	Paving Equipment	2	8.00	130	0.36
Grading	Scrapers	0	8.00	361	0.48
Building Construction	Welders	1	8.00	46	0.45

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
Grading	5	13.00	0.00	63.00	12.40	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	7	2.00	1.00	0.00	12.40	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	12.40	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	0.00	0.00	0.00	12.40	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Clean Paved Roads

3.2 Grading - 2016

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	lb/day										lb/day					
Fugitive Dust					10.0018	0.0000	10.0018	3.7401	0.0000	3.7401			0.0000			0.0000
Off-Road	3.3263	35.1916	23.6661	0.0266		1.9478	1.9478		1.7920	1.7920		2,770.1116	2,770.1116	0.8356		2,787.6585
Total	**3.3263**	**35.1916**	**23.6661**	**0.0266**	**10.0018**	**1.9478**	**11.9496**	**3.7401**	**1.7920**	**5.5320**		**2,770.1116**	**2,770.1116**	**0.8356**		**2,787.6585**

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	lb/day										lb/day					
Hauling	0.0680	0.9084	0.6665	2.3700e-003	0.0549	0.0123	0.0671	0.0150	0.0113	0.0263		238.4386	238.4386	1.7600e-003		238.4756
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
Worker	0.0527	0.0631	0.7379	1.5100e-003	0.1226	9.9000e-004	0.1236	0.0325	9.0000e-004	0.0334		126.7140	126.7140	6.5000e-003		126.8504
Total	**0.1207**	**0.9715**	**1.4044**	**3.8800e-003**	**0.1775**	**0.0133**	**0.1907**	**0.0476**	**0.0122**	**0.0597**		**365.1526**	**365.1526**	**8.2600e-003**		**365.3260**

3.2 Grading - 2016

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	lb/day										lb/day					
Fugitive Dust					4.5008	0.0000	4.5008	1.6830	0.0000	1.6830			0.0000			0.0000
Off-Road	3.3263	35.1916	23.6661	0.0266		1.9478	1.9478		1.7920	1.7920	0.0000	2,770.1116	2,770.1116	0.8356		2,787.6585
Total	**3.3263**	**35.1916**	**23.6661**	**0.0266**	**4.5008**	**1.9478**	**6.4486**	**1.6830**	**1.7920**	**3.4750**	**0.0000**	**2,770.1116**	**2,770.1116**	**0.8356**		**2,787.6585**

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	lb/day										lb/day					
Hauling	0.0680	0.9084	0.6665	2.3700e-003	0.0549	0.0123	0.0671	0.0150	0.0113	0.0263		238.4386	238.4386	1.7600e-003		238.4756
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
Worker	0.0527	0.0631	0.7379	1.5100e-003	0.1226	9.9000e-004	0.1236	0.0325	9.0000e-004	0.0334		126.7140	126.7140	6.5000e-003		126.8504
Total	**0.1207**	**0.9715**	**1.4044**	**3.8800e-003**	**0.1775**	**0.0133**	**0.1907**	**0.0476**	**0.0122**	**0.0597**		**365.1526**	**365.1526**	**8.2600e-003**		**365.3260**

3.3 Building Construction - 2016

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	lb/day										lb/day					
Off-Road	2.8813	23.7049	15.1326	0.0226		1.5848	1.5848		1.4965	1.4965		2,227.3468	2,227.3468	0.5287		2,238.4501
Total	**2.8813**	**23.7049**	**15.1326**	**0.0226**		**1.5848**	**1.5848**		**1.4965**	**1.4965**		**2,227.3468**	**2,227.3468**	**0.5287**		**2,238.4501**

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	lb/day										lb/day					
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
Vendor	0.0113	0.0969	0.1156	2.4000e-004	6.6500e-003	1.4900e-003	8.1400e-003	1.9000e-003	1.3700e-003	3.2700e-003		23.9153	23.9153	1.9000e-004		23.9193
Worker	8.1100e-003	9.7100e-003	0.1135	2.3000e-004	0.0189	1.5000e-004	0.0190	5.0000e-003	1.4000e-004	5.1400e-003		19.4945	19.4945	1.0000e-003		19.5155
Total	**0.0194**	**0.1066**	**0.2292**	**4.7000e-004**	**0.0255**	**1.6400e-003**	**0.0272**	**6.9000e-003**	**1.5100e-003**	**8.4100e-003**		**43.4098**	**43.4098**	**1.1900e-003**		**43.4347**

3.3 Building Construction - 2016

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	lb/day										lb/day					
Off-Road	2.8813	23.7049	15.1326	0.0226		1.5848	1.5848		1.4965	1.4965	0.0000	2,227.3468	2,227.3468	0.5287		2,238.4501
Total	**2.8813**	**23.7049**	**15.1326**	**0.0226**		**1.5848**	**1.5848**		**1.4965**	**1.4965**	**0.0000**	**2,227.3468**	**2,227.3468**	**0.5287**		**2,238.4501**

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	lb/day										lb/day					
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
Vendor	0.0113	0.0969	0.1156	2.4000e-004	6.6500e-003	1.4900e-003	8.1400e-003	1.9000e-003	1.3700e-003	3.2700e-003		23.9153	23.9153	1.9000e-004		23.9193
Worker	8.1100e-003	9.7100e-003	0.1135	2.3000e-004	0.0189	1.5000e-004	0.0190	5.0000e-003	1.4000e-004	5.1400e-003		19.4945	19.4945	1.0000e-003		19.5155
Total	**0.0194**	**0.1066**	**0.2292**	**4.7000e-004**	**0.0255**	**1.6400e-003**	**0.0272**	**6.9000e-003**	**1.5100e-003**	**8.4100e-003**		**43.4098**	**43.4098**	**1.1900e-003**		**43.4347**

3.4 Paving - 2016

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	lb/day										lb/day					
Off-Road	2.0898	22.3859	14.8176	0.0223		1.2610	1.2610		1.1601	1.1601		2,316.3767	2,316.3767	0.6987		2,331.0495
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**2.0898**	**22.3859**	**14.8176**	**0.0223**		**1.2610**	**1.2610**		**1.1601**	**1.1601**		**2,316.3767**	**2,316.3767**	**0.6987**		**2,331.0495**

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	lb/day										lb/day					
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
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
Worker	0.0609	0.0729	0.8514	1.7400e-003	0.1415	1.1400e-003	0.1426	0.0375	1.0400e-003	0.0386		146.2084	146.2084	7.5000e-003		146.3659
Total	**0.0609**	**0.0729**	**0.8514**	**1.7400e-003**	**0.1415**	**1.1400e-003**	**0.1426**	**0.0375**	**1.0400e-003**	**0.0386**		**146.2084**	**146.2084**	**7.5000e-003**		**146.3659**

3.4 Paving - 2016

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	lb/day										lb/day					
Off-Road	2.0898	22.3859	14.8176	0.0223		1.2610	1.2610		1.1601	1.1601	0.0000	2,316.3767	2,316.3767	0.6987		2,331.0495
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**2.0898**	**22.3859**	**14.8176**	**0.0223**		**1.2610**	**1.2610**		**1.1601**	**1.1601**	**0.0000**	**2,316.3767**	**2,316.3767**	**0.6987**		**2,331.0495**

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	lb/day										lb/day					
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
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
Worker	0.0609	0.0729	0.8514	1.7400e-003	0.1415	1.1400e-003	0.1426	0.0375	1.0400e-003	0.0386		146.2084	146.2084	7.5000e-003		146.3659
Total	**0.0609**	**0.0729**	**0.8514**	**1.7400e-003**	**0.1415**	**1.1400e-003**	**0.1426**	**0.0375**	**1.0400e-003**	**0.0386**		**146.2084**	**146.2084**	**7.5000e-003**		**146.3659**

3.5 Architectural Coating - 2016

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	lb/day										lb/day					
Archit. Coating	14.0788					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.3685	2.3722	1.8839	2.9700e-003		0.1966	0.1966		0.1966	0.1966		281.4481	281.4481	0.0332		282.1449
Total	**14.4473**	**2.3722**	**1.8839**	**2.9700e-003**		**0.1966**	**0.1966**		**0.1966**	**0.1966**		**281.4481**	**281.4481**	**0.0332**		**282.1449**

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	lb/day										lb/day					
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
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
Worker	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**

3.5 Architectural Coating - 2016

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	lb/day										lb/day					
Archit. Coating	14.0788					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.3685	2.3722	1.8839	2.9700e-003		0.1966	0.1966		0.1966	0.1966	0.0000	281.4481	281.4481	0.0332		282.1449
Total	**14.4473**	**2.3722**	**1.8839**	**2.9700e-003**		**0.1966**	**0.1966**		**0.1966**	**0.1966**	**0.0000**	**281.4481**	**281.4481**	**0.0332**		**282.1449**

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	lb/day										lb/day					
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
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
Worker	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**

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	lb/day										lb/day					
Mitigated	0.1852	0.3874	1.7559	3.4900e-003	0.2389	5.2900e-003	0.2442	0.0639	4.8600e-003	0.0688		305.5133	305.5133	0.0128		305.7814
Unmitigated	0.1852	0.3874	1.7559	3.4900e-003	0.2389	5.2900e-003	0.2442	0.0639	4.8600e-003	0.0688		305.5133	305.5133	0.0128		305.7814

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Single Family Housing	47.85	50.40	43.85	106,356	106,356
Total	47.85	50.40	43.85	106,356	106,356

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
Single Family Housing	12.40	4.30	5.40	26.10	29.10	44.80	86	11	3

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.546434	0.062864	0.174629	0.123506	0.034170	0.004889	0.015456	0.023695	0.002073	0.003288	0.006639	0.000690	0.001668

4.4 Fleet Mix

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	lb/day										lb/day					
NaturalGas Mitigated	5.2100e-003	0.0445	0.0190	2.8000e-004		3.6000e-003	3.6000e-003		3.6000e-003	3.6000e-003		56.8621	56.8621	1.0900e-003	1.0400e-003	57.2082
NaturalGas Unmitigated	5.2100e-003	0.0445	0.0190	2.8000e-004		3.6000e-003	3.6000e-003		3.6000e-003	3.6000e-003		56.8621	56.8621	1.0900e-003	1.0400e-003	57.2082

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	lb/day										lb/day					
Single Family Housing	483.328	5.2100e-003	0.0445	0.0190	2.8000e-004		3.6000e-003	3.6000e-003		3.6000e-003	3.6000e-003		56.8621	56.8621	1.0900e-003	1.0400e-003	57.2082
Total		**5.2100e-003**	**0.0445**	**0.0190**	**2.8000e-004**		**3.6000e-003**	**3.6000e-003**		**3.6000e-003**	**3.6000e-003**		**56.8621**	**56.8621**	**1.0900e-003**	**1.0400e-003**	**57.2082**

5.2 Energy by Land Use - NaturalGas

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	lb/day										lb/day					
Single Family Housing	0.483328	5.2100e-003	0.0445	0.0190	2.8000e-004		3.6000e-003	3.6000e-003		3.6000e-003	3.6000e-003		56.8621	56.8621	1.0900e-003	1.0400e-003	57.2082
Total		**5.2100e-003**	**0.0445**	**0.0190**	**2.8000e-004**		**3.6000e-003**	**3.6000e-003**		**3.6000e-003**	**3.6000e-003**		**56.8621**	**56.8621**	**1.0900e-003**	**1.0400e-003**	**57.2082**

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	lb/day										lb/day					
Mitigated	10.2263	0.1349	12.3812	3.7400e-003		1.6750	1.6750		1.6749	1.6749	173.1185	68.6839	241.8024	0.1304	0.0141	248.9105
Unmitigated	10.2263	0.1349	12.3812	3.7400e-003		1.6750	1.6750		1.6749	1.6749	173.1185	68.6839	241.8024	0.1304	0.0141	248.9105

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	lb/day										lb/day					
Architectural Coating	0.0771					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.1926					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Hearth	9.9434	0.1300	11.9629	3.7200e-003		1.6727	1.6727		1.6727	1.6727	173.1185	67.9412	241.0597	0.1296	0.0141	248.1519
Landscaping	0.0132	4.8900e-003	0.4183	2.0000e-005		2.2600e-003	2.2600e-003		2.2600e-003	2.2600e-003		0.7428	0.7428	7.6000e-004		0.7587
Total	**10.2263**	**0.1349**	**12.3812**	**3.7400e-003**		**1.6750**	**1.6750**		**1.6749**	**1.6749**	**173.1185**	**68.6839**	**241.8024**	**0.1304**	**0.0141**	**248.9105**

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	lb/day										lb/day					
Architectural Coating	0.0771					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.1926					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Hearth	9.9434	0.1300	11.9629	3.7200e-003		1.6727	1.6727		1.6727	1.6727	173.1185	67.9412	241.0597	0.1296	0.0141	248.1519
Landscaping	0.0132	4.8900e-003	0.4183	2.0000e-005		2.2600e-003	2.2600e-003		2.2600e-003	2.2600e-003		0.7428	0.7428	7.6000e-004		0.7587
Total	**10.2263**	**0.1349**	**12.3812**	**3.7400e-003**		**1.6750**	**1.6750**		**1.6749**	**1.6749**	**173.1185**	**68.6839**	**241.8024**	**0.1304**	**0.0141**	**248.9105**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

Shannon Road

San Francisco Bay Area Air Basin, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Single Family Housing	5.00	Dwelling Unit	13.00	9,000.00	14

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2016
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	630.89	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - 13 acres 5 sf homes

Construction Phase - Grading: 20 days, Construction: 200 days, Paving: 20 days

Off-road Equipment - Grading: 1 excavator, 1 grader, 1 dozer, 2 loader/backhoes

Off-road Equipment - Construction: 1 crane, 2 forklifts, 1 gen set, 2 loader/backhoes, 1 welder

Off-road Equipment - Paving: 2 pavers, 2 paving equipment, 2 rollers

Grading - 500 CY export

Construction Off-road Equipment Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	300.00	200.00
tblConstructionPhase	NumDays	30.00	20.00
tblConstructionPhase	PhaseEndDate	1/12/2017	12/15/2016
tblConstructionPhase	PhaseEndDate	11/3/2016	11/17/2016
tblConstructionPhase	PhaseStartDate	12/16/2016	11/18/2016
tblConstructionPhase	PhaseStartDate	1/29/2016	2/12/2016
tblGrading	AcresOfGrading	10.00	75.00
tblGrading	MaterialExported	0.00	500.00
tblLandUse	LotAcreage	1.62	13.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblProjectCharacteristics	OperationalYear	2014	2016

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					
2016	0.4906	2.9921	1.9654	2.8700e-003	0.1056	0.1928	0.2984	0.0389	0.1814	0.2203	0.0000	259.0335	259.0335	0.0624	0.0000	260.3446
Total	**0.4906**	**2.9921**	**1.9654**	**2.8700e-003**	**0.1056**	**0.1928**	**0.2984**	**0.0389**	**0.1814**	**0.2203**	**0.0000**	**259.0335**	**259.0335**	**0.0624**	**0.0000**	**260.3446**

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					
2016	0.4906	2.9921	1.9654	2.8700e-003	0.0505	0.1928	0.2434	0.0183	0.1814	0.1997	0.0000	259.0332	259.0332	0.0624	0.0000	260.3443
Total	**0.4906**	**2.9921**	**1.9654**	**2.8700e-003**	**0.0505**	**0.1928**	**0.2434**	**0.0183**	**0.1814**	**0.1997**	**0.0000**	**259.0332**	**259.0332**	**0.0624**	**0.0000**	**260.3443**

	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**	**52.12**	**0.00**	**18.44**	**52.89**	**0.00**	**9.34**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

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	0.0829	1.0300e-003	0.0866	5.0000e-005		7.3200e-003	7.3200e-003		7.3200e-003	7.3200e-003	0.7423	0.2545	0.9967	1.5900e-003	4.0000e-005	1.0427
Energy	9.5000e-004	8.1300e-003	3.4600e-003	5.0000e-005		6.6000e-004	6.6000e-004		6.6000e-004	6.6000e-004	0.0000	19.5344	19.5344	6.5000e-004	2.7000e-004	19.6313
Mobile	0.0312	0.0711	0.3136	5.7000e-004	0.0396	9.1000e-004	0.0405	0.0106	8.4000e-004	0.0115	0.0000	45.1024	45.1024	1.9900e-003	0.0000	45.1442
Waste						0.0000	0.0000		0.0000	0.0000	1.1936	0.0000	1.1936	0.0705	0.0000	2.6749
Water						0.0000	0.0000		0.0000	0.0000	0.1034	0.7101	0.8135	0.0107	2.6000e-004	1.1169
Total	**0.1151**	**0.0802**	**0.4037**	**6.7000e-004**	**0.0396**	**8.8900e-003**	**0.0485**	**0.0106**	**8.8200e-003**	**0.0194**	**2.0392**	**65.6014**	**67.6406**	**0.0854**	**5.7000e-004**	**69.6099**

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	0.0829	1.0300e-003	0.0866	5.0000e-005		7.3200e-003	7.3200e-003		7.3200e-003	7.3200e-003	0.7423	0.2545	0.9967	1.5900e-003	4.0000e-005	1.0427
Energy	9.5000e-004	8.1300e-003	3.4600e-003	5.0000e-005		6.6000e-004	6.6000e-004		6.6000e-004	6.6000e-004	0.0000	19.5344	19.5344	6.5000e-004	2.7000e-004	19.6313
Mobile	0.0312	0.0711	0.3136	5.7000e-004	0.0396	9.1000e-004	0.0405	0.0106	8.4000e-004	0.0115	0.0000	45.1024	45.1024	1.9900e-003	0.0000	45.1442
Waste						0.0000	0.0000		0.0000	0.0000	1.1936	0.0000	1.1936	0.0705	0.0000	2.6749
Water						0.0000	0.0000		0.0000	0.0000	0.1034	0.7101	0.8135	0.0107	2.6000e-004	1.1167
Total	**0.1151**	**0.0802**	**0.4037**	**6.7000e-004**	**0.0396**	**8.8900e-003**	**0.0485**	**0.0106**	**8.8200e-003**	**0.0194**	**2.0392**	**65.6014**	**67.6406**	**0.0854**	**5.7000e-004**	**69.6098**

	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	Grading	Grading	1/1/2016	1/28/2016	5	20	
2	Building Construction	Building Construction	2/12/2016	11/17/2016	5	200	
3	Paving	Paving	11/18/2016	12/15/2016	5	20	
4	Architectural Coating	Architectural Coating	11/18/2016	12/15/2016	5	20	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 75

Acres of Paving: 0

Residential Indoor: 18,225; Residential Outdoor: 6,075; Non-Residential Indoor: 0; Non-Residential Outdoor: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Grading	Excavators	1	8.00	162	0.38
Building Construction	Cranes	1	7.00	226	0.29
Building Construction	Forklifts	2	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Paving	Pavers	2	8.00	125	0.42
Paving	Rollers	2	8.00	80	0.38
Grading	Rubber Tired Dozers	1	8.00	255	0.40
Building Construction	Tractors/Loaders/Backhoes	2	7.00	97	0.37
Grading	Graders	1	8.00	174	0.41
Grading	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Paving	Paving Equipment	2	8.00	130	0.36
Grading	Scrapers	0	8.00	361	0.48
Building Construction	Welders	1	8.00	46	0.45

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
Grading	5	13.00	0.00	63.00	12.40	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	7	2.00	1.00	0.00	12.40	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	12.40	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	0.00	0.00	0.00	12.40	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Clean Paved Roads

3.2 Grading - 2016

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					
Fugitive Dust					0.1000	0.0000	0.1000	0.0374	0.0000	0.0374	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0333	0.3519	0.2367	2.7000e-004		0.0195	0.0195		0.0179	0.0179	0.0000	25.1300	25.1300	7.5800e-003	0.0000	25.2892
Total	**0.0333**	**0.3519**	**0.2367**	**2.7000e-004**	**0.1000**	**0.0195**	**0.1195**	**0.0374**	**0.0179**	**0.0553**	**0.0000**	**25.1300**	**25.1300**	**7.5800e-003**	**0.0000**	**25.2892**

3.2 Grading - 2016

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	7.4000e-004	9.4300e-003	8.1400e-003	2.0000e-005	5.3000e-004	1.2000e-004	6.5000e-004	1.5000e-004	1.1000e-004	2.6000e-004	0.0000	2.1610	2.1610	2.0000e-005	0.0000	2.1613
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	4.9000e-004	7.1000e-004	6.9200e-003	1.0000e-005	1.1800e-003	1.0000e-005	1.1900e-003	3.1000e-004	1.0000e-005	3.2000e-004	0.0000	1.0702	1.0702	6.0000e-005	0.0000	1.0714
Total	**1.2300e-003**	**0.0101**	**0.0151**	**3.0000e-005**	**1.7100e-003**	**1.3000e-004**	**1.8400e-003**	**4.6000e-004**	**1.2000e-004**	**5.8000e-004**	**0.0000**	**3.2311**	**3.2311**	**8.0000e-005**	**0.0000**	**3.2327**

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					
Fugitive Dust					0.0450	0.0000	0.0450	0.0168	0.0000	0.0168	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0333	0.3519	0.2367	2.7000e-004		0.0195	0.0195		0.0179	0.0179	0.0000	25.1300	25.1300	7.5800e-003	0.0000	25.2892
Total	**0.0333**	**0.3519**	**0.2367**	**2.7000e-004**	**0.0450**	**0.0195**	**0.0645**	**0.0168**	**0.0179**	**0.0348**	**0.0000**	**25.1300**	**25.1300**	**7.5800e-003**	**0.0000**	**25.2892**

3.2 Grading - 2016

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	7.4000e-004	9.4300e-003	8.1400e-003	2.0000e-005	5.3000e-004	1.2000e-004	6.5000e-004	1.5000e-004	1.1000e-004	2.6000e-004	0.0000	2.1610	2.1610	2.0000e-005	0.0000	2.1613
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	4.9000e-004	7.1000e-004	6.9200e-003	1.0000e-005	1.1800e-003	1.0000e-005	1.1900e-003	3.1000e-004	1.0000e-005	3.2000e-004	0.0000	1.0702	1.0702	6.0000e-005	0.0000	1.0714
Total	**1.2300e-003**	**0.0101**	**0.0151**	**3.0000e-005**	**1.7100e-003**	**1.3000e-004**	**1.8400e-003**	**4.6000e-004**	**1.2000e-004**	**5.8000e-004**	**0.0000**	**3.2311**	**3.2311**	**8.0000e-005**	**0.0000**	**3.2327**

3.3 Building Construction - 2016

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	0.2881	2.3705	1.5133	2.2600e-003		0.1585	0.1585		0.1496	0.1496	0.0000	202.0615	202.0615	0.0480	0.0000	203.0688
Total	**0.2881**	**2.3705**	**1.5133**	**2.2600e-003**		**0.1585**	**0.1585**		**0.1496**	**0.1496**	**0.0000**	**202.0615**	**202.0615**	**0.0480**	**0.0000**	**203.0688**

3.3 Building Construction - 2016

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	1.2700e-003	0.0100	0.0148	2.0000e-005	6.4000e-004	1.5000e-004	7.9000e-004	1.8000e-004	1.4000e-004	3.2000e-004	0.0000	2.1626	2.1626	2.0000e-005	0.0000	2.1630
Worker	7.6000e-004	1.1000e-003	0.0107	2.0000e-005	1.8100e-003	2.0000e-005	1.8300e-003	4.8000e-004	1.0000e-005	5.0000e-004	0.0000	1.6464	1.6464	9.0000e-005	0.0000	1.6483
Total	**2.0300e-003**	**0.0111**	**0.0254**	**4.0000e-005**	**2.4500e-003**	**1.7000e-004**	**2.6200e-003**	**6.6000e-004**	**1.5000e-004**	**8.2000e-004**	**0.0000**	**3.8090**	**3.8090**	**1.1000e-004**	**0.0000**	**3.8113**

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	0.2881	2.3705	1.5133	2.2600e-003		0.1585	0.1585		0.1496	0.1496	0.0000	202.0613	202.0613	0.0480	0.0000	203.0685
Total	**0.2881**	**2.3705**	**1.5133**	**2.2600e-003**		**0.1585**	**0.1585**		**0.1496**	**0.1496**	**0.0000**	**202.0613**	**202.0613**	**0.0480**	**0.0000**	**203.0685**

3.3 Building Construction - 2016

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	1.2700e-003	0.0100	0.0148	2.0000e-005	6.4000e-004	1.5000e-004	7.9000e-004	1.8000e-004	1.4000e-004	3.2000e-004	0.0000	2.1626	2.1626	2.0000e-005	0.0000	2.1630
Worker	7.6000e-004	1.1000e-003	0.0107	2.0000e-005	1.8100e-003	2.0000e-005	1.8300e-003	4.8000e-004	1.0000e-005	5.0000e-004	0.0000	1.6464	1.6464	9.0000e-005	0.0000	1.6483
Total	**2.0300e-003**	**0.0111**	**0.0254**	**4.0000e-005**	**2.4500e-003**	**1.7000e-004**	**2.6200e-003**	**6.6000e-004**	**1.5000e-004**	**8.2000e-004**	**0.0000**	**3.8090**	**3.8090**	**1.1000e-004**	**0.0000**	**3.8113**

3.4 Paving - 2016

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	0.0209	0.2239	0.1482	2.2000e-004		0.0126	0.0126		0.0116	0.0116	0.0000	21.0138	21.0138	6.3400e-003	0.0000	21.1469
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0209**	**0.2239**	**0.1482**	**2.2000e-004**		**0.0126**	**0.0126**		**0.0116**	**0.0116**	**0.0000**	**21.0138**	**21.0138**	**6.3400e-003**	**0.0000**	**21.1469**

3.4 Paving - 2016

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	5.7000e-004	8.2000e-004	7.9800e-003	2.0000e-005	1.3600e-003	1.0000e-005	1.3700e-003	3.6000e-004	1.0000e-005	3.7000e-004	0.0000	1.2348	1.2348	7.0000e-005	0.0000	1.2362
Total	**5.7000e-004**	**8.2000e-004**	**7.9800e-003**	**2.0000e-005**	**1.3600e-003**	**1.0000e-005**	**1.3700e-003**	**3.6000e-004**	**1.0000e-005**	**3.7000e-004**	**0.0000**	**1.2348**	**1.2348**	**7.0000e-005**	**0.0000**	**1.2362**

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	0.0209	0.2239	0.1482	2.2000e-004		0.0126	0.0126		0.0116	0.0116	0.0000	21.0138	21.0138	6.3400e-003	0.0000	21.1469
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0209**	**0.2239**	**0.1482**	**2.2000e-004**		**0.0126**	**0.0126**		**0.0116**	**0.0116**	**0.0000**	**21.0138**	**21.0138**	**6.3400e-003**	**0.0000**	**21.1469**

3.4 Paving - 2016

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	5.7000e-004	8.2000e-004	7.9800e-003	2.0000e-005	1.3600e-003	1.0000e-005	1.3700e-003	3.6000e-004	1.0000e-005	3.7000e-004	0.0000	1.2348	1.2348	7.0000e-005	0.0000	1.2362
Total	**5.7000e-004**	**8.2000e-004**	**7.9800e-003**	**2.0000e-005**	**1.3600e-003**	**1.0000e-005**	**1.3700e-003**	**3.6000e-004**	**1.0000e-005**	**3.7000e-004**	**0.0000**	**1.2348**	**1.2348**	**7.0000e-005**	**0.0000**	**1.2362**

3.5 Architectural Coating - 2016

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					
Archit. Coating	0.1408					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	3.6800e-003	0.0237	0.0188	3.0000e-005		1.9700e-003	1.9700e-003		1.9700e-003	1.9700e-003	0.0000	2.5533	2.5533	3.0000e-004	0.0000	2.5596
Total	**0.1445**	**0.0237**	**0.0188**	**3.0000e-005**		**1.9700e-003**	**1.9700e-003**		**1.9700e-003**	**1.9700e-003**	**0.0000**	**2.5533**	**2.5533**	**3.0000e-004**	**0.0000**	**2.5596**

3.5 Architectural Coating - 2016

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	0.0000	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
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**	**0.0000**	**0.0000**

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					
Archit. Coating	0.1408					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	3.6800e-003	0.0237	0.0188	3.0000e-005		1.9700e-003	1.9700e-003		1.9700e-003	1.9700e-003	0.0000	2.5533	2.5533	3.0000e-004	0.0000	2.5596
Total	**0.1445**	**0.0237**	**0.0188**	**3.0000e-005**		**1.9700e-003**	**1.9700e-003**		**1.9700e-003**	**1.9700e-003**	**0.0000**	**2.5533**	**2.5533**	**3.0000e-004**	**0.0000**	**2.5596**

3.5 Architectural Coating - 2016

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	0.0000	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
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**	**0.0000**	**0.0000**

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	0.0312	0.0711	0.3136	5.7000e-004	0.0396	9.1000e-004	0.0405	0.0106	8.4000e-004	0.0115	0.0000	45.1024	45.1024	1.9900e-003	0.0000	45.1442
Unmitigated	0.0312	0.0711	0.3136	5.7000e-004	0.0396	9.1000e-004	0.0405	0.0106	8.4000e-004	0.0115	0.0000	45.1024	45.1024	1.9900e-003	0.0000	45.1442

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Single Family Housing	47.85	50.40	43.85	106,356	106,356
Total	47.85	50.40	43.85	106,356	106,356

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
Single Family Housing	12.40	4.30	5.40	26.10	29.10	44.80	86	11	3

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.546434	0.062864	0.174629	0.123506	0.034170	0.004889	0.015456	0.023695	0.002073	0.003288	0.006639	0.000690	0.001668

5.0 Energy Detail

4.4 Fleet Mix

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	10.1202	10.1202	4.7000e-004	1.0000e-004	10.1598
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	10.1202	10.1202	4.7000e-004	1.0000e-004	10.1598
NaturalGas Mitigated	9.5000e-004	8.1300e-003	3.4600e-003	5.0000e-005		6.6000e-004	6.6000e-004		6.6000e-004	6.6000e-004	0.0000	9.4142	9.4142	1.8000e-004	1.7000e-004	9.4715
NaturalGas Unmitigated	9.5000e-004	8.1300e-003	3.4600e-003	5.0000e-005		6.6000e-004	6.6000e-004		6.6000e-004	6.6000e-004	0.0000	9.4142	9.4142	1.8000e-004	1.7000e-004	9.4715

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					
Single Family Housing	176415	9.5000e-004	8.1300e-003	3.4600e-003	5.0000e-005		6.6000e-004	6.6000e-004		6.6000e-004	6.6000e-004	0.0000	9.4142	9.4142	1.8000e-004	1.7000e-004	9.4715
Total		**9.5000e-004**	**8.1300e-003**	**3.4600e-003**	**5.0000e-005**		**6.6000e-004**	**6.6000e-004**		**6.6000e-004**	**6.6000e-004**	**0.0000**	**9.4142**	**9.4142**	**1.8000e-004**	**1.7000e-004**	**9.4715**

5.2 Energy by Land Use - NaturalGas

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					
Single Family Housing	176415	9.5000e-004	8.1300e-003	3.4600e-003	5.0000e-005		6.6000e-004	6.6000e-004		6.6000e-004	6.6000e-004	0.0000	9.4142	9.4142	1.8000e-004	1.7000e-004	9.4715
Total		**9.5000e-004**	**8.1300e-003**	**3.4600e-003**	**5.0000e-005**		**6.6000e-004**	**6.6000e-004**		**6.6000e-004**	**6.6000e-004**	**0.0000**	**9.4142**	**9.4142**	**1.8000e-004**	**1.7000e-004**	**9.4715**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Single Family Housing	35364.7	10.1202	4.7000e-004	1.0000e-004	10.1598
Total		**10.1202**	**4.7000e-004**	**1.0000e-004**	**10.1598**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Single Family Housing	35364.7	10.1202	4.7000e-004	1.0000e-004	10.1598
Total		**10.1202**	**4.7000e-004**	**1.0000e-004**	**10.1598**

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	0.0829	1.0300e-003	0.0866	5.0000e-005		7.3200e-003	7.3200e-003		7.3200e-003	7.3200e-003	0.7423	0.2545	0.9967	1.5900e-003	4.0000e-005	1.0427
Unmitigated	0.0829	1.0300e-003	0.0866	5.0000e-005		7.3200e-003	7.3200e-003		7.3200e-003	7.3200e-003	0.7423	0.2545	0.9967	1.5900e-003	4.0000e-005	1.0427

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	0.0141					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0352					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	0.0325	5.9000e-004	0.0490	5.0000e-005		7.1200e-003	7.1200e-003		7.1200e-003	7.1200e-003	0.7423	0.1938	0.9361	1.5300e-003	4.0000e-005	0.9807
Landscaping	1.1900e-003	4.4000e-004	0.0376	0.0000		2.0000e-004	2.0000e-004		2.0000e-004	2.0000e-004	0.0000	0.0606	0.0606	6.0000e-005	0.0000	0.0619
Total	**0.0829**	**1.0300e-003**	**0.0866**	**5.0000e-005**		**7.3200e-003**	**7.3200e-003**		**7.3200e-003**	**7.3200e-003**	**0.7423**	**0.2545**	**0.9967**	**1.5900e-003**	**4.0000e-005**	**1.0427**

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	0.0141					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0352					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	0.0325	5.9000e-004	0.0490	5.0000e-005		7.1200e-003	7.1200e-003		7.1200e-003	7.1200e-003	0.7423	0.1938	0.9361	1.5300e-003	4.0000e-005	0.9807
Landscaping	1.1900e-003	4.4000e-004	0.0376	0.0000		2.0000e-004	2.0000e-004		2.0000e-004	2.0000e-004	0.0000	0.0606	0.0606	6.0000e-005	0.0000	0.0619
Total	**0.0829**	**1.0300e-003**	**0.0866**	**5.0000e-005**		**7.3200e-003**	**7.3200e-003**		**7.3200e-003**	**7.3200e-003**	**0.7423**	**0.2545**	**0.9967**	**1.5900e-003**	**4.0000e-005**	**1.0427**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.8135	0.0107	2.6000e-004	1.1167
Unmitigated	0.8135	0.0107	2.6000e-004	1.1169

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Single Family Housing	0.32577 / 0.205377	0.8135	0.0107	2.6000e-004	1.1169
Total		**0.8135**	**0.0107**	**2.6000e-004**	**1.1169**

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Single Family Housing	0.32577 / 0.205377	0.8135	0.0107	2.6000e-004	1.1167
Total		**0.8135**	**0.0107**	**2.6000e-004**	**1.1167**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	1.1936	0.0705	0.0000	2.6749
Unmitigated	1.1936	0.0705	0.0000	2.6749

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Single Family Housing	5.88	1.1936	0.0705	0.0000	2.6749
Total		**1.1936**	**0.0705**	**0.0000**	**2.6749**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Single Family Housing	5.88	1.1936	0.0705	0.0000	2.6749
Total		**1.1936**	**0.0705**	**0.0000**	**2.6749**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

Attachment B
Arborist Report

Deborah Ellis, MS

Consulting Arborist & Horticulturist

Service since 1984

PRELIMINARY ARBORIST REPORT

Tree Inventory, Tree Descriptions and Recommendations Relative to Proposed Construction

Project Address:

15215 Shannon Road
Los Gatos, California

Property Owner:

Sahadi

Prepared for:

Jennifer Savage
Town of Los Gatos Community Planning Department
110 E. Main Street
Los Gatos, CA 95031

Prepared by:
Deborah Ellis, MS.
Consulting Arborist & Horticulturist
Registered Consulting Arborist #305, American Society of Consulting Arborists
Board Certified Master Arborist WE-0457B, International Society of Arboriculture
Certified Professional Horticulturist #30022, American Society for Horticultural Science

RECEIVED
JUN 15 2015
TOWN OF LOS GATOS
PLANNING DIVISION

JUNE 15, 2015
Report History: This is my first report for this project.

PO Box 3714, Saratoga, CA 95070. 408-725-1357. decah@pacbell.net. http://www.decah.com.

Deborah Ellis, MS

Consulting Arborist & Horticulturist

Service since 1984

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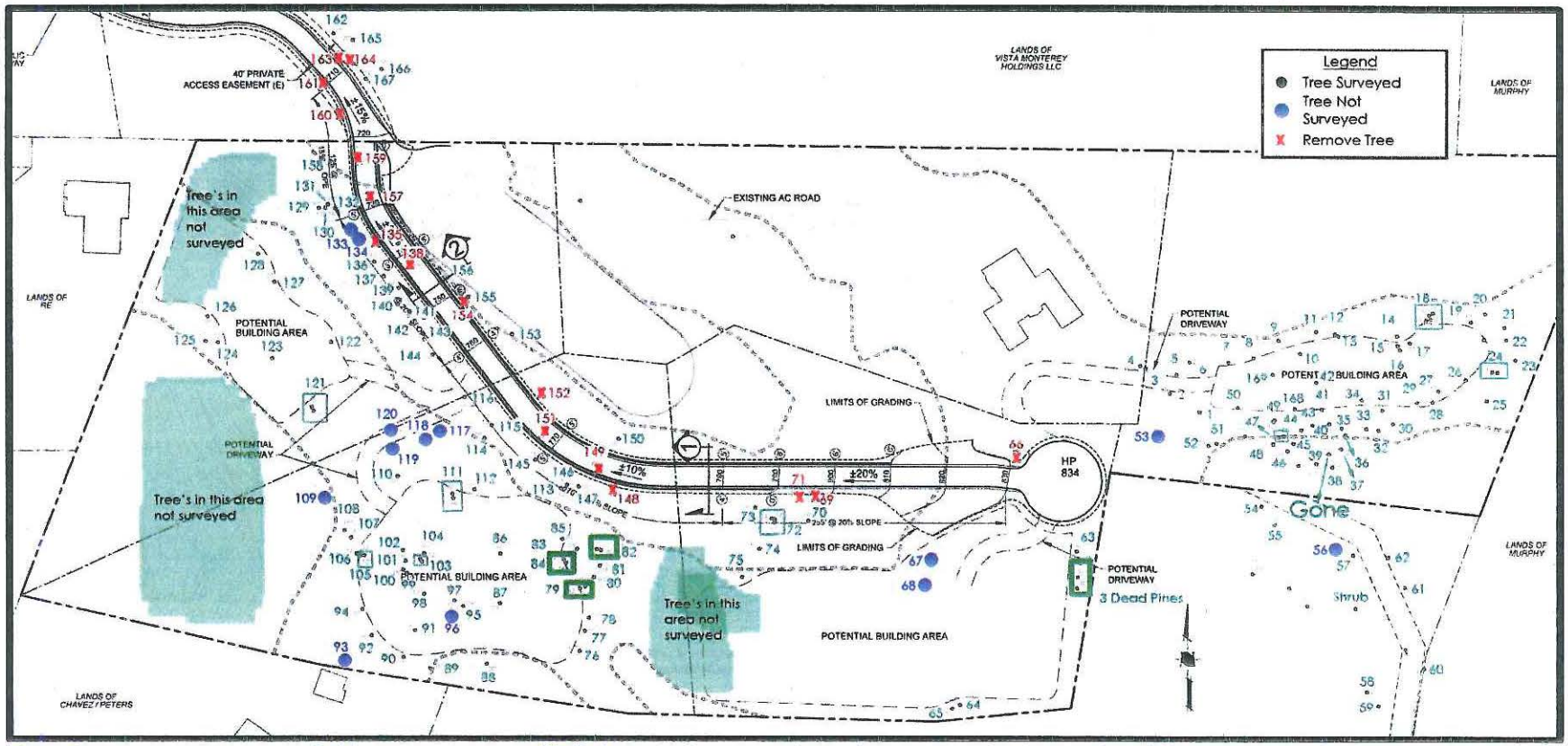
Cover photo: Looking west to east from the top of Lot #1. **Coast live oaks #23 and 42** are labeled. All photos in this report were taken by D. Ellis during May, 2015.

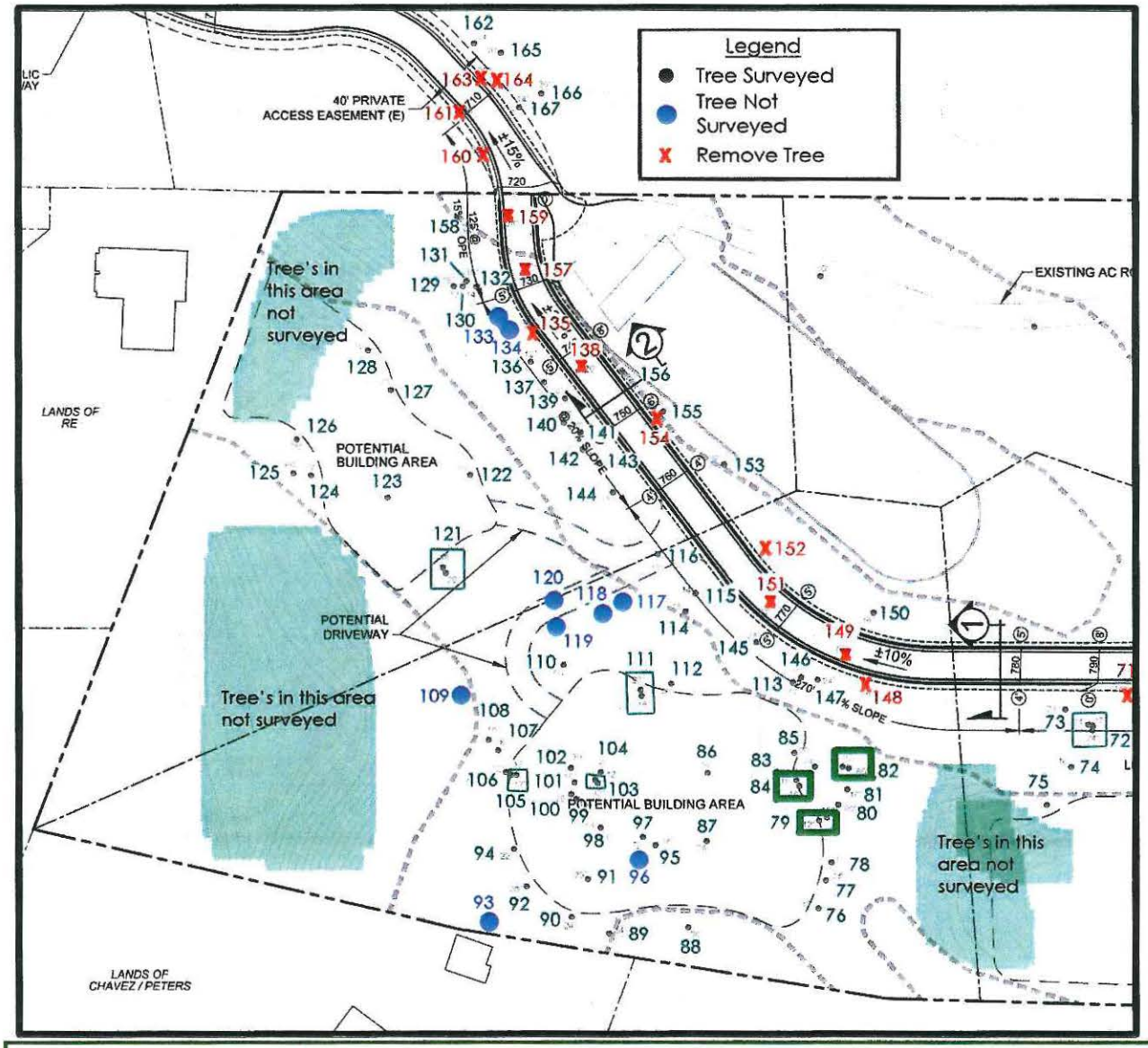
PO Box 3714, Saratoga, CA 95070. 408-725-1357. decah@pacbell.net. http://www.decah.com.

TREE MAP #1 COMPLETE SITE

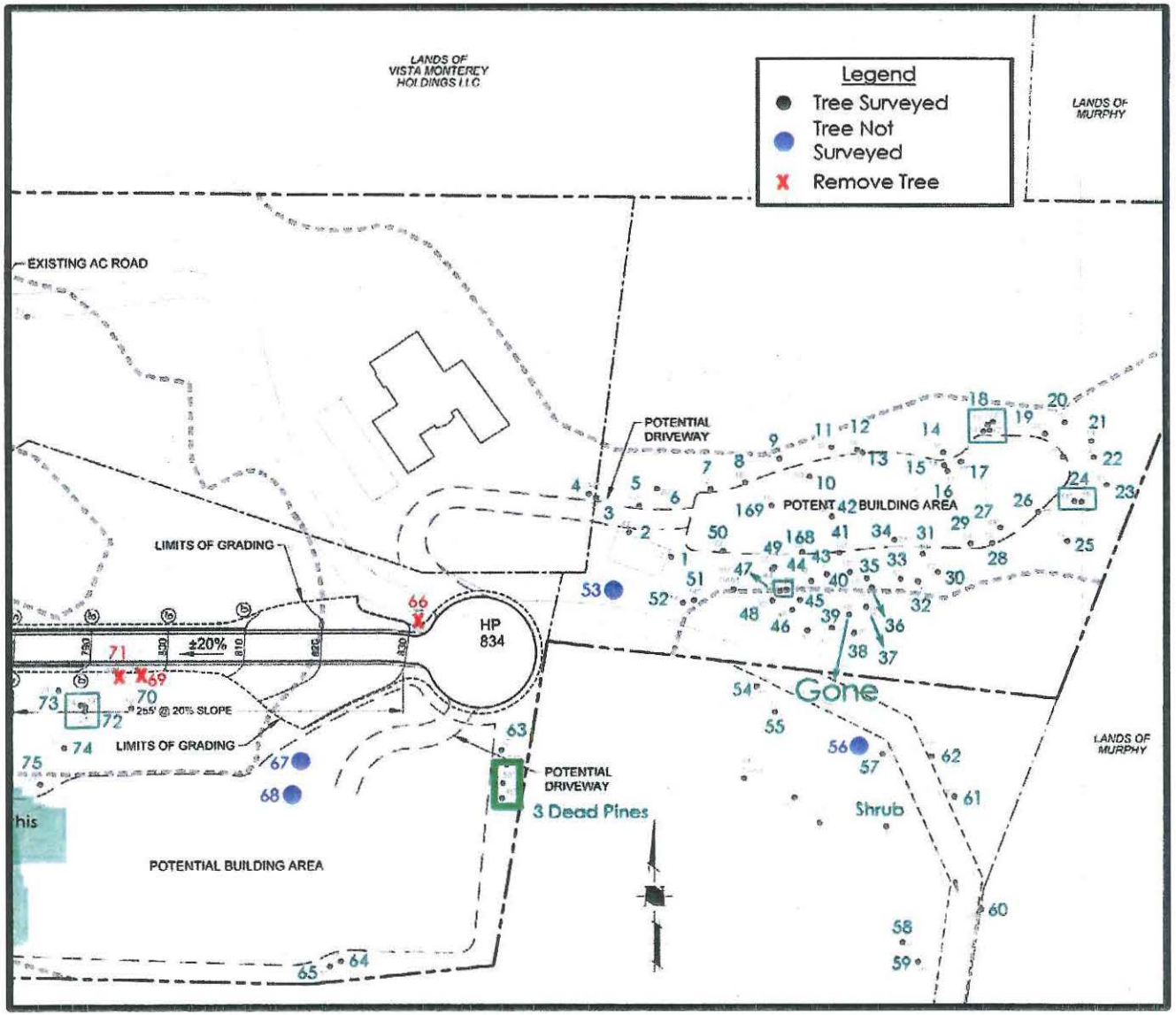


Note that a separate copy of this tree map, as a .PDF that can be printed at a larger size, is also enclosed for your convenience.

TREE MAP #2 WEST SITE



TREE MAP #3
EAST SITE



SUMMARY

THE PROJECT

A large multi-acre parcel with one single-family home and guest cottages will be subdivided into 5 separate single-family home parcels with a minimum lot size of 2.5 acres.

THE TREES

One-hundred, sixty-nine (169) ***protected trees***[1] on or just adjacent to the project site were evaluated for this report. These trees are described briefly in the *Summary Tree Table* (Table 1) beginning on page 6 and in greater detail in the *Complete Tree Table* (Table 3) beginning on page 17. The project construction plans (with the exception of a proposed private drive through the site) have not yet been developed, but at this time it appears that **five trees obviously located in the proposed private roadway through the site and will have to be removed. These are trees #138, 149, 151, 157 and 159. An additional 11 trees appear to be within or very close to the limit of grading for the roadway, and so these trees will also need to be removed (trees #66, 69, 71, 135, 148, 152, 154, 160, 161, 163 and 164**). Therefore a total of **16 trees** have been marked for removal on the Tree Maps and listed as "Remove" in the Action column of the Tree Tables. Due to the conceptual Grading Plan scale of 1:50, it is difficult to make accurate measurements when trees are close to proposed grading, particularly since the tree trunk symbols are all the same size. It is possible therefore, that it will be possible to save some of the trees listed for removal, and vice versa. We require more detailed plans at a larger scale (e.g. 1:10 or 1:20) in order to more accurately estimate construction impacts to the trees.

There are many existing tree trunk symbols missing on the plans should be included on the plans. On the Tree Maps included in this report we have highlighted areas where additional trees need to be surveyed and added to the plans. There are also some missing trees within areas where some of the trees have been surveyed. After the missing trees are added to the project plans, we can prepare a second arborist report including these additional trees. We would like the civil engineer to include our tree tag numbers on the plans with the missing trees, so that it is easier to find the new trees. Right now the plans are confusing in many places, due to the missing trees as well as fences and other landmarks on the property.

[1] For the purpose of this project, a protected tree in Los Gatos as defined in the Los Gatos Town Code, Division 2 Tree Protection, Section 29.10.0960, 12/3/2010 the Scope of Protected Trees is any tree with a 4-inch or greater diameter of any trunk, when removal relates to any review for which zoning approval or subdivision approval is required. Town Street trees of any size are protected. Fruit trees less than 18 inches in trunk diameter are exempt.

The tree *Preservation Suitability* ratings and *Tree Root Protection Distances* listed for individual trees in this report will be helpful to the project architects in deciding which trees to retain and how far improvements should be located from these trees during the design process. In the *Summary Table* of this report we have color-coded those trees that we have evaluated on the *Tree Maps* on pages 1 through 3.

The evaluated trees are classified into three preservation suitability groups, as described below:

- **Forty-seven (47) trees are classified as having "Good" or "Fair/Good" preservation suitability.** These are the better trees on the site, and those that are most worthy of retaining or transplanting. They comprise 28% of the evaluated trees.

- **Seventy-four (74) trees are classified as having "Fair" preservation suitability.** These are "so-so" trees and I do not recommend going through too much trouble to retain them. They comprise 47% of the evaluated trees.

- **Forty-seven (47) trees are classified as having "Unacceptable", "Poor" or "Fair/Poor" preservation suitability.** They comprise 28% of the evaluated trees. I would not put any effort into retaining any of them. Those trees listed as "Poor" and/ or "Unacceptable" should be removed unless they are far from people and their things so that if they fall apart they will not cause personal injury or property damage. Trees listed as "Unacceptable" are dead.

- **One tree is classified as having "Uncertain" preservation suitability**. This is **tree #111, a 21 & 23" black oak**. This is a prominent tree, but it has some basal trunk decay which should be evaluated further by a qualified consulting arborist before a decision is made to save or remove. The owner may contact me for more information and a proposal for this further evaluation, which may include tomography of the lower trunk.

- **At this time, based upon the plans that I have reviewed, sixteen (16) trees will need to be removed** because they are within the path of the proposed private roadway through the site. These are **trees #66, 69, 71, 135, 138, 148, 149, 151, 152, 154, 157, 159, 160, 161, 163 and 164.**

As the construction plans for the project are developed I recommend that I review these plans and produce additional reports describing the expected impact of construction on those trees that will remain. I can also work with the architects to reduce construction impacts to trees where possible. I can eventually prepare a *Final Arborist Report* listing trees to remain, trees to be removed and *Tree Protection Specifications* for those trees that will remain.

TABLE 1 SUMMARY TREE TABLE

Continued through page 12.

** indicates tree trunk was not located on the plans we reviewed; and so we tentatively plotted the tree's location in our tree maps.*

Tree #	Common Name	Trunk Diam. @3ft. (in.)	Preservation Suitability	Expected Construction Impact	Action	Reason
1	coast live oak	18,20,22	Fair/Poor			
2	coast live oak	16,11	Fair/Poor			
3	coast live oak	19	Fair/Poor			
4	coast live oak	14	Fair			
5	valley oak	13,15	Fair			
6	blue oak	19	Fair			
7	coast live oak	13*5,14	Fair			
8	coast live oak	16	Fair			
9	coast live oak	13	Poor			
10	coast live oak	16,18	Fair			
11	coast live oak	15,21	Fair			
12	coast live oak	12	Fair/Poor			
13	coast live oak	15	Fair			
14	coast live oak	11,12	Fair			
15	coast live oak	13	Fair/Poor			
16	coast live oak	12	Fair			
17	coast live oak	12,12,14	Fair			
18	coast live oak	9,10,14,16,16	Fair/Poor			
19	coast live oak	11,11,16	Fair/Poor			
20	coast live oak	11,14	Fair			
21	coast live oak	12	Fair			
22	coast live oak	12	Fair			
23	coast live oak	8,12,13	Fair			
24	coast live oak	15,17	Fair			

Tree #	Common Name	Trunk Diam. @3ft. (in.)	Preservation Suitability	Expected Construction Impact	Action	Reason
25	coast live oak	11	Fair/Poor			
26	coast live oak	11,13,13,15,17	Fair			
27	coast live oak	13,14	Fair			
28	coast live oak	9,13,14,15,16	Fair			
29	blue oak	12,15	Fair			
30	coast live oak	9,11,12	Fair			
31	coast live oak	58	Fair			
32	coast live oak	10,10,10,13	Fair/Poor			
33	Calif. bay (bay)	6	Fair/Poor			
34	coast live oak	22	Fair/Poor			
35	coast live oak	12	Fair			
36	coast live oak	8	Poor			
37	coast live oak	10	Fair			
38	coast live oak	6,3	Fair			
39	coast live oak	9	Fair/Good			
40	coast live oak	11	Fair/Poor			
41	coast live oak	8,9,12,14,14	Fair/Poor			
42	coast live oak	11,12,13	Fair			
43	coast live oak	9	Fair/Good			
44	olive	5,3	Fair			
45	coast live oak	7	Fair/Poor			
46	coast live oak	,10,12,14,14	Fair/Poor			
47	coast live oak	9,11,14,21	Fair			
48	coast live oak	11,17	Fair			
49	coast live oak	10,13,22	Fair			
50	blue oak	13,13	Fair/Good			
51	coast live oak	16	Good			

Tree #	Common Name	Trunk Diam. @3ft. (in.)	Preservation Suitability	Expected Construction Impact	Action	Reason
52	Italian stone pine	33	Fair/Poor			
53	coast live oak	14	Fair			
54	coast live oak	20	Good			
55	coast live oak	10	Fair/Good			
*56	coast live oak	6	Fair/Poor			
57	coast live oak	18,25	Good			
58	elderberry	4,5	Fair/Poor			
59	coast live oak	28	Good			
60	coast live oak	27	Fair/Good			
61	coast live oak	19	Fair/Good			
62	valley oak	17	Fair			
63	Monterey pine	27	Poor/Unacceptable			
64	coast live oak	44	Fair/Good			
65	coast live oak	32	Fair/Good			
66	English holly	5,6,6,8	Fair	Severe	Remove	Construction
*67	coast live oak	34	Good			
*68	coast live oak	17	Good			
69	coast live oak	26	Fair/Good	Severe	Remove	Construction
70	coast live oak	12	Fair			
71	coast live oak	16	Fair/Good	Severe	Remove	Construction
72	coast live oak	8,9,10,25	Good			
73	coast live oak	24	Good			
74	coast live oak	16	Fair			
75	coast live oak	21	Fair/Good			
76	valley oak	14	Fair			
77	coast live oak	25	Poor			
78	coast live oak	16	Fair			

Tree #	Common Name	Trunk Diam. @3ft. (in.)	Preservation Suitability	Expected Construction Impact	Action	Reason
79	coast live oak	18,13	Poor			
80	coast live oak	11,12,14,16,19	Fair			
81	black oak	20	Fair/Poor			
82	coast live oak	9,18,19	Fair			
83	coast live oak	23	Fair			
84	black oak	16,18	Fair/Poor			
85	blue oak	21	Fair/Good			
86	coast live oak	36	Good			
87	coast live oak	31	Fair			
88	coast live oak	35	Fair/Good			
89	coast live oak	39	Poor			
90	coast live oak	27	Fair/Good			
91	coast live oak	19	Good			
92	coast live oak	23	Poor			
*93	blue oak	33	Fair			
94	coast live oak	17	Good			
95	coast live oak	16	Fair/Poor			
*96	coast live oak	15,18	Fair			
97	coast live oak	13,18,24	Fair			
98	coast live oak	10,11,13	Fair/Poor			
99	coast live oak	17	Fair/Poor			
100	coast live oak	24	Poor			
101	coast live oak	15	Fair			
102	coast live oak	25	Fair			
103	coast live oak	14,14	Fair/Poor			
104	coast live oak	18	Fair/Good			
105	blue oak	12,13	Fair/Poor			

Tree #	Common Name	Trunk Diam. @3ft. (in.)	Preservation Suitability	Expected Construction Impact	Action	Reason
106	coast live oak	14	Fair			
107	valley oak	8	Unacceptable			
*108	coast live oak	20	Fair/Good			
*109	coast live oak	10, 15, 17, 18, 18	Fair			
110	coast live oak	13,18,19	Fair/Good			
111	black oak	21,23	Uncertain			
112	valley oak	29	Poor			
113	coast live oak	11	Fair			
114	coast live oak	21	Good			
115	coast live oak	15	Fair/Good			
116	coast live oak	16	Good			
*117	coast live oak	8	Fair/Good			
*118	valley oak	28	Fair/Good			
*119	coast live oak	40	Fair/Good			
*120	coast live oak	40	Fair/Good			
121	coast live oak	10,13,15,15,19	Fair			
122	coast live oak	41	Good			
123	coast live oak	17,18,18	Fair/Good			
124	coast live oak	14,23,27	Fair			
125	coast live oak	14,15,17,18	Fair			
126	coast live oak	10,11,14, 15,15,15,15,19	Fair			
127	coast live oak	20	Good			
128	coast live oak	18	Fair/Poor			
129	coast live oak	18	Fair			
130	coast live oak	15	Fair/Poor			
131	coast live oak	15	Fair			
132	coast live oak	14	Fair			

Tree #	Common Name	Trunk Diam. @3ft. (in.)	Preservation Suitability	Expected Construction Impact	Action	Reason
*133	coast live oak	11	Fair			
*134	coast live oak	24	Fair/Poor			
135	coast live oak	18	Poor	Severe	Remove	Construction, Structure
136	coast live oak	11	Fair/Poor			
137	coast live oak	9	Fair/Good			
138	coast live oak	22	Good	Severe	Remove	Construction
139	coast live oak	8	Fair			
140	coast live oak	7,7	Fair			
141	coast live oak	6,7	Fair			
142	coast live oak	6,3	Fair			
143	coast live oak	8	Fair			
144	coast live oak	4,4,8,8	Fair			
145	coast live oak	21	Fair/Poor			
146	coast live oak	9	Poor			
147	coast live oak	27	Fair/Good			
148	coast live oak	21	Good	Severe	Remove	Construction
149	coast live oak	7,6	Fair/Poor	Severe	Remove	Construction/Structure
150	blue elderberry	16	Fair	Severe	Remove	Construction
151	coast live oak	26	Good			
152	coast live oak	16,18	Fair	Severe	Remove	Construction
153	coast live oak	11	Fair			
154	coast live oak	11	Fair/Good	Severe	Remove	Construction
155	coast live oak	9	Fair			
156	purpleleaf plum	9	Fair/Poor			
*157	coast live oak	22	Fair	Severe	Remove	Construction
158	coast live oak	15	Fair			
159	coast live oak	27	Fair			

Tree #	Common Name	Trunk Diam. @3ft. (in.)	Preservation Suitability	Expected Construction Impact	Action	Reason
160	coast live oak	22	Good	Severe	Remove	Construction
161	coast live oak	32	Fair	Severe	Remove	Construction
162	coast live oak	27	Fair			
163	coast live oak	21	Fair	Severe	Remove	Construction
164	coast live oak	30	Fair/Good	Severe	Remove	Construction
165	coast live oak	20	Fair/Poor			
166	coast live oak	20,24	Fair			
167	coast live oak	9,10	Poor			
168	coast live oak	23	Fair/Poor			
169	coast live oak	19	Fair/Good			

End of Table

** indicates tree trunk was not located on the plans we reviewed; and so we tentatively plotted the tree's location in our tree maps.*

RECOMMENDATIONS

1. **Which trees to retain?** Try to design around and retain as many of trees as possible with "Good" and "Fair/Good" preservation suitability ratings. Trees with "Fair" preservation suitability should be saved when possible, but I don't recommend making a significant effort to save them. No effort should be made to retain trees with "Fair/Poor" or "Poor" preservation suitability. Trees recommended for further evaluation by the arborist should be evaluated in greater detail if they may remain. If no further evaluation will be performed on these trees then it is probably best to remove these them for reasons of safety.

2. **Existing trees to be saved or removed should be numbered on all site-based plans to match the tree tag numbers that are used in this arborist report.** This will help us and others to find these trees in the field, as well as to find nearby trees that we will evaluate in the future. Note that there have been previous tree surveys on the project site and there are additional tags on some of the trees, as explained below.

3. **The tree trunk symbols of missing trees (both those noted in this report as well as trees that have not been evaluated) must be included on an existing topographic survey of the property as well as all site-based project construction plans.** Tree trunks must be included on the plans if they are adjacent to any proposed improvement. There are many missing trees that are among other trees that have been surveyed and included on the plans. Anticipate that additional improvements may be added to the plans in the future, so it is better to survey too many trees than too few trees, from a project efficiency standpoint.

4. **I should review all site-based plans for this project:** I have reviewed the plan sheets listed on page 16. Additional improvements on plans that were not reviewed or have been revised may cause additional trees to be impacted and/or removed. Plans reviewed by the arborist should be full-size, to-scale and with accurately located tree trunks and canopy driplines relative to proposed improvements. Scale should be 1:20 or 1:10. The current scale of 1:50 is too large to accurately estimate construction impacts to trees.

5. **For those trees that will be retained on the site, the applicant and his or her general contractor must follow the Town of Los Gatos *Tree Protection Directions*** on pages 36 through 38. The *Directions* must be incorporated into the final project plans. These Directions shall replace any tree protection notes, specifications or other directions (including detail drawings) that are included in the plans. Additional tree protection information is also available from Deborah Ellis if necessary.

6. **As a part of the design process, try to keep improvements (and any additional over-excavation or work area beyond the improvement) as far from tree trunks and canopies as possible.** *5xDBH*[2] or the dripline of the tree, whichever is greater, should be used as the minimum distance for any soil disturbance to the edge of the trunk. *3xDBH* should be considered the absolute minimum distance from any disturbance to the tree trunk on one side of the trunk only, for root protection. Farther is better, of course. For disturbances on multiple sides of the trunk, then 5xDBH or greater should be used, and farther is also better here. Tree canopies must also be taken into consideration when designing around trees. Don't forget the minimum necessary working margin around improvements as you locate those improvements. Disturbance usually comes much closer to trees than the lines shown on the plans!

7. **General Tree Maintenance:**
   a. **The root collars and lower trunks of some of the trees were obscured from view by vegetation, excess soil or other covering.** Such portions of the tree should be uncovered and the tree re-evaluated by the arborist.
   b. **Do no unnecessary pruning, fertilization or other tree work.** Pre-construction pruning should be limited to the absolute minimum required for construction clearance. A qualified tree service should be hired to provide such pruning.

[2] 3 & 5xDBH: See page 35 for an explanation of these calculations which are used to estimate root protection distances for trees.

INTRODUCTION

PURPOSE & USE OF REPORT

This survey and report was required by the Town of Los Gatos as a part of the Planned Development application for this project. The purpose of the report is to identify and describe the existing protected trees on site - - their size, condition and suitability for preservation. The audience for this report is the property owner, developer, project architects and contractors, and Town of Los Gatos authorities concerned with tree preservation and tree removal. The goal of this report is to preserve the existing protected trees on site that are in acceptable condition, are good species for the area and will fit in well with the proposed new use of the site.

METHODOLOGY

I performed a brief evaluation of the subject trees on during several days in May of 2015. Tree characteristics such as form, weight distribution, foliage color and density, wounds and indicators of decay were noted. Surrounding site conditions were also observed. Evaluation procedures were taken from:

- *Guide for Plant Appraisal*, 9th edition, 2000, authored by the Council of Tree and Landscape Appraisers (CTLA) and published by the International Society of Arboriculture (ISA).
- *Species Classification and Group Assignment* published by the Western Chapter of the International Society of Arboriculture (WCISA), 1992.

The above references serve as industry professional standards for tree and landscape evaluations.

I measured the trunk diameter of each tree with a diameter tape at 3 feet above the ground, which is the required trunk diameter measurement height of the Town of Los Gatos. Trunk diameter was extrapolated to *DBH* (diameter at breast height, 4.5 feet above the ground) because DBH is also used calculate tree protection distances and other tree-related factors. The DBH figure is not included in the Tree Tables, but I have used it to estimate construction impacts to trees. Trunk diameter was rounded to the nearest inch. I estimated the tree's height and canopy spread. Tree *Condition* (structure and vigor) was evaluated and I also recorded additional notes for trees when significant. Tree species and condition considered in combination with the current or (if applicable) proposed use of the site yields the *Tree Preservation Suitability* rating. The more significant trees (or groups of trees) were photographed with a digital camera. Some of these photos are included in this report, but all photos are available from me by email if requested.

PLANS REVIEWED

Table 2

PLAN	DATE	SHEET	REVIEWED	NOTES
Existing Site Topographic Map *including existing tree trunk locations*				
Proposed Site Layout	2/2015	3.0	X	Conceptual
Demolition				
Construction Staging				
Grading/Drainage	2/2015	4.0	X	Conceptual Grading plan showing proposed private roadway through project site, with 5 separate lots and potential building area.
Erosion Control				
Underground Utility	2/2015	5.0, 5.1	X	Conceptual Water Plan, Conceptual Sanitary Sewer Plan (no trees included)
Site & Building Sections				
Building Exterior Elevations				
Roof				
Shadow Study				
Construction Details *that would affect trees (for example building foundations, pavement installation including sub-grade preparation, underground utility installation)*				
Landscape Planting				
Irrigation Plan				
Landscape & Irrigation Details				

OBSERVATIONS

SITE CONDITIONS

There is an existing single-family, one-story house plus two guest cottages on the site, and a swimming pool which is currently empty of water. There is a small amount of planted and irrigated landscaping near the main house. The remainder of the site is natural growth native oak woodland. The majority of evaluated trees on the project site (83%) are coast live oaks, followed by other native tree species including oaks (18%) and less than 1% non-native planted trees. Site topography is mainly level near these structures, but it slopes steeply down to the North and South as the developed area of the property is along a ridgetop. Sun exposure for the trees varies from full to partly shaded, depending upon proximity to other trees. Most of the evaluated trees are not in good condition. Indeed, only 28% of these trees have been rated as having "Good" or "Fair/Good" preservation suitability. The majority of the trees (72%) were rated as having "Fair" or lesser preservation suitability.

APPENDIX

TABLE 3 COMPLETE TREE TABLE

This Table is continued through page 30. Data fields in the Table are explained on pages 31 to 34.

** indicates tree trunk was not located on the plans we reviewed; and so we tentatively plotted the tree's location in our tree maps.*

Tree #	*Species* & Common Name	Trunk Diam. @3ft. (in.)	Size	CONDITION		Preservation Suitability	Expected Construction Impact	Action	Reason	Notes	TREE ROOT PROTECTION DISTANCES		
				Vigor	Structure						3xDBH	5xDBH	OTPZ
1	*Quercus agrifolia*, coast live oak	18,20,22	40*45	70	50	Fair/Poor				Condition: several cavities in trunk and branches from a previous trunk or branch removals. Two trunks press against adjacent building.	10	17	30

Tree #	Species & Common Name	Trunk Diam. @3ft. (in.)	Size	CONDITION		Preservation Suitability	Expected Construction Impact	Action	Reason	Notes	TREE ROOT PROTECTION DISTANCES		
				Vigor	Structure						3xDBH	5xDBH	OTPZ
2	coast live oak	16,11	30*35	50	50	Fair/Poor				Condition: decay in trunk from a previous branch removal.	5	9	16
3	coast live oak	19	35*30	45	50	Fair/Poor				Condition: sunscald on trunk, much twig dieback.	5	8	14
4	coast live oak	14	35*30	50	60	Fair					3	6	7
5	*Quercus lobata*, valley oak	13,15	45*55	60	60	Fair					5	9	22
6	*Quercus douglasii*, blue oak	19	45*45	65	65	Fair				Condition: tree is located in irrigated lawn with grass right up to trunk. Not a good idea – out native oaks should be summer dry! Gold fines are on the other side of the trunk.	5	8	19
7	coast live oak	13*5,14	40*45	75	60	Fair				Condition: stump sprout with lawn up to trunk and underneath almost the entire canopy of the tree.	12	19	35
8	coast live oak	16	40*30	80	60	Fair				Condition: same as previous, plus this tree has a large basal wound on the trunk.	4	7	8
9	coast live oak	13	40*25	45	40	Poor				Condition: lawn is 7 feet from the trunk.	3	5	6
10	coast live oak	16,18	45*35	60	60	Fair					6	11	19
11	coast live oak	15,21	50*40	70	50	Fair				Condition: trunk bulge indicates a propagating internal crack which should be investigated further.	7	12	21
12	coast live oak	12	40*18	50	40	Fair/Poor				Condition: very grove affected.	3	5	6

Tree #	Species & Common Name	Trunk Diam. @3ft. (in.)	Size	CONDITION		Preservation Suitability	Expected Construction Impact	Action	Reason	Notes	TREE ROOT PROTECTION DISTANCES		
				Vigor	Structure						3xDBH	5xDBH	OTPZ
13	coast live oak	15	45*25	50	60	Fair				Condition: bleeding spot on trunk, but no bay trees nearby, so probably not Sudden Oak Death (SOD).	4	6	7
14	coast live oak	11,12	25*25	60	50	Fair				Condition: stump sprout, trunks sweep significantly.	4	7	8
15	coast live oak	13	40*20	60	40	Fair/Poor				Condition: stump sprout like the previous tree and very grove affected like many trees on this site.	3	5	6
16	coast live oak	12	30*20	60	50	Fair				Condition: basal wounds to trunk, trunk sweeps due to grove effect.	3	5	6
17	coast live oak	12,12,14	40*50	60	50	Fair				Condition: stump sprout with cavity between trunks.	6	11	19
18	coast live oak	9,10,14,16,16	40*50	50	50	Fair/Poor				Condition: also includes alternate tags #142-144. The 9" and 10" trunks are dead. This tree is comprised of 6 trunks spread out over a 4x10 foot area. This may be one or two separate stump sprout trees, but all trees are probably root grafted.	10	17	30
19	coast live oak	11,11,16	32*40	60	45	Fair/Poor				Condition: stump sprout with central decay.	7	11	20
20	coast live oak	11,14	40*30	60	60	Fair				Condition: lawn clippings have been dumped around the trunk.	5	8	15
21	coast live oak	12	45*18	60	50	Fair					3	5	6

Tree #	Species & Common Name	Trunk Diam. @3ft. (in.)	Size	CONDITION		Preservation Suitability	Expected Construction Impact	Action	Reason	Notes	TREE ROOT PROTECTION DISTANCES		
				Vigor	Structure						3xDBH	5xDBH	OTPZ
22	coast live oak	12	45*16	60	50	Fair					3	5	6
23	coast live oak	8,12,13	45*25	65	50	Fair				Condition: stump sprout.	6	9	17
24	coast live oak	15,17	45*48	65	60	Fair				Condition: stump sprout.	6	10	18
25	coast live oak	11	22*22	60	40	Fair/Poor				Condition: a very splayed out tree, very grove affected.	3	4	5
26	coast live oak	11,13,13,15,17	50*40	60	50	Fair				Condition: stump sprout with central decayed area.	11	18	32
27	coast live oak	13,14	45*35	65	60	Fair				Condition: stump sprout.	5	9	15
28	coast live oak	9,13,14,15,16	50*50	60	50	Fair				Condition: stump sprout with central decay.	10	17	31
29	blue oak	12,15	55*45	50	50	Fair					5	9	21
30	coast live oak	9,11,12	35*25	75	50	Fair				Condition: stump sprout with central and basal decay.	5	9	10
31	coast live oak	58	45*40	60	50	Fair				Condition: stump sprout with deep, decayed central area.	14	24	58
32	coast live oak	10,10,10,13	35*30	45	45	Fair/Poor				Condition: one 10" trunk is dead, the other one is dying.	7	12	21
33	*Umbellularia californica*, Calif. bay (bay)	6	16*15	80	60	Fair/Poor				Condition: trunk wound and canker. Small bay in the vicinity SOD-susceptible oaks.	3	4	5
34	coast live oak	22	30*30	50	60	Fair/Poor					5	9	16
35	coast live oak	12	28*20	60	50	Fair					3	5	6
36	coast live oak	8	18*8	40	40	Poor					3	4	5
37	coast live oak	10	25*16	60	50	Fair					3	4	5

Tree #	Species & Common Name	Trunk Diam. @3ft. (in.)	Size	CONDITION		Preservation Suitability	Expected Construction Impact	Action	Reason	Notes	TREE ROOT PROTECTION DISTANCES		
				Vigor	Structure						3xDBH	5xDBH	OTPZ
38	coast live oak	6,3	20*15	65	60	Fair					3	4	5
39	coast live oak	9	18*16	70	60	Fair/Good					3	4	5
40	coast live oak	11	22*16	60	40	Fair/Poor					3	4	5
41	coast live oak	8,9,12,14,14	35*30	60	45	Fair/Poor				Condition: refoliating via epicormic sprouts.	9	15	27
42	coast live oak	11,12,13	35*35	60	50	Fair				Condition: stump sprout	6	10	18
43	coast live oak	9	18*22	75	70	Fair/Good					3	4	5
44	*Olea europaea*, olive	5,3	18*15	70	60	Fair				Condition: shaded.	3	4	5
45	coast live oak	7	16*6	50	40	Fair/Poor				Condition: trunk broke.	3	4	5
46	coast live oak	,10,12,14,14	50*40	45	45	Fair/Poor				Condition: stump sprout, 8" trunk dead, significant branch dieback.	9	15	27
47	coast live oak	9,11,14, 21	50*45	60	50	Fair				Condition: some dead branches but tree is refoliating via epicormic sprouts. The 9 and 18" trunks are 18" from the other trunks.	9	16	28
48	coast live oak	11,17	30*30	75	50	Fair				Condition: trunk sweeps and jogs.	6	9	17
49	coast live oak	10,13,22	45*40	60	50	Fair				Condition: stump sprout.	8	14	25
50	blue oak	13,13	45*35	60	70	Fair/Good					5	8	20
51	coast live oak	16	35*30	75	75	Good				Condition: somewhat shaded by adjacent large stone pine.	4	7	8
52	*Pinus pinea*, Italian stone pine	33	60*50	80	50	Fair/Poor				Condition: precariously positioned at the edge of a short slope, and leans toward the existing driveway. Most of the weight is over the lean. Two co-dominant	8	14	41

Tree #	*Species* & Common Name	Trunk Diam. @3ft. (in.)	Size	CONDITION		Preservation Suitability	Expected Construction Impact	Action	Reason	Notes	TREE ROOT PROTECTION DISTANCES		
				Vigor	Structure						3xDBH	5xDBH	OTPZ
										leaders with included bark. One girdling root over a buttress root.			
53	coast live oak	14	30*30	70	50	Fair				Condition: shaded and subdued by the large stone pine #52.	3	6	7
54	coast live oak	20	30*35	80	70	Good				Condition: one small bleeding spot on trunk but no bays around.	5	8	15
55	coast live oak	10	25*25	85	60	Fair/Good					3	4	5
*56	coast live oak	6	22*22	60	40	Fair/Poor				Condition: trunk jogs and sweeps underneath the adjacent larger coast live oaks.	3	4	5
57	coast live oak	18,25	42*50	80	65	Good				Condition: barbed wire embedded 6" in trunk. Do not pull out but cut wire on either side of trunk.	8	14	25
58	elderberry	4,5	16*16	40	40	Poor/ Unacceptable				Condition: mostly dead. Very shaded by larger oaks.	3	4	7
59	coast live oak	28	45*45	85	70	Good					7	12	21
60	coast live oak	27	50*50	75	60	Fair/Good				Condition: boundary line tree whose trunk straddles the property line.	7	11	20
61	coast live oak	19	35*35	75	60	Fair/Good				Condition: exposed roots downslope.	5	8	14
62	valley oak	17	38*30	60	60	Fair					4	7	12
63	*Pinus radiata,* Monterey pine	27	60*50	20	20	Poor/ Unacceptable				Condition: two fused trunks of 20 and 22". The 20" trunk is dead and half of the 22" trunk is dead. Three Monterey pines to the right	7	11	27

Tree #	Species & Common Name	Trunk Diam. @3ft. (in.)	Size	CONDITION		Preservation Suitability	Expected Construction Impact	Action	Reason	Notes	TREE ROOT PROTECTION DISTANCES		
				Vigor	Structure						3xDBH	5xDBH	OTPZ
										(18-30") are dead and a 24" pine fell over at the roots and damaged a nearby fence.			
64	coast live oak	44	30*40	70	50	Fair/Good				Condition: a prominent tree along with adjacent coast live oak #65. This tree (#64) has a basal trunk wound with some decay and also a scaffold branch pruning removal wound with a cavity.	11	18	44
65	coast live oak	32	30*40	80	50	Fair/Good					8	13	32
66	*Ilex aquifolium*, English holly	5,6,6,8	22"22	60	60	Fair	Severe	Remove	Construction	Construction: very close to or within grading for proposed roadway.	4	7	17
*67	coast live oak	34	45*60	90	75	Good					8	14	34
*68	coast live oak	17	25*22	85	70	Good					4	7	8
69	coast live oak	26	40*40	85	60	Fair/Good	Severe	Remove	Construction	Construction: very close to grading for proposed roadway.	6	11	19
70	coast live oak	12	28*22	65	60	Fair					3	5	6
71	coast live oak	16	30*20	70	70	Fair/Good	Severe	Remove	Construction	Construction: very close to grading for proposed roadway.	4	7	8
72	coast live oak	8,9,10,25	45*50	80	70	Good				Condition: the smaller trunks are suckers or seedlings of this tree or nearby coast live oaks.	8	14	25
73	coast live oak	24	50*40	80	80	Good					6	10	18
74	coast live oak	16	35*25	60	60	Fair					4	7	12

Tree #	Species & Common Name	Trunk Diam. @3ft. (in.)	Size	CONDITION		Preservation Suitability	Expected Construction Impact	Action	Reason	Notes	TREE ROOT PROTECTION DISTANCES		
				Vigor	Structure						3xDBH	5xDBH	OTPZ
75	coast live oak	21	35*40	75	60	Fair/Good					5	9	15
76	valley oak	14	35*25	60	50	Fair					3	6	10
77	coast live oak	25	45*12	50	20	Poor				Condition: all that remains of this tree is a large hollow trunk with one live scaffold branch.	6	10	18
78	coast live oak	16	30x18	75	50	Fair					4	7	8
79	coast live oak	18,13	40x25	70	20	Poor				Condition: the bases of both trunks are hollow.	6	10	18
80	coast live oak	11,12,14,16,19	45x30	70	50	Fair				Condition: stump sprout with a cavity that should be further inspected if the tree may remain.	11	19	34
81	*Quercus kelloggii*, black oak	20	50x35	50	40	Fair/Poor				Condition: basal trunk wound plus poor overall structure.	5	8	20
82	coast live oak	9,18,19	45x35	60	60	Fair				Condition: stump sprout.	8	14	24
83	coast live oak	23	45x35	50	60	Fair					6	9	17
84	black oak	16,18	48x45	60	45	Fair/Poor				Condition: stump sprout with basal decay in both trunks.	6	11	26
85	blue oak	21	40x35	50	70	Fair/Good					5	9	21
86	coast live oak	36	45x60	70	70	Good					9	15	36
87	coast live oak	31	40x35	60	60	Fair					8	13	31
88	coast live oak	35	40x40	65	70	Fair/Good					9	14	35
89	coast live oak	39	45x45	70	20	Poor				Condition: extensive trunk decay.	10	16	39
90	coast live oak	27	35x35	70	60	Fair/Good					7	11	20
91	coast live oak	19	30x30	75	70	Good					5	8	14

Tree #	Species & Common Name	Trunk Diam. @3ft. (in.)	Size	CONDITION		Preservation Suitability	Expected Construction Impact	Action	Reason	Notes	TREE ROOT PROTECTION DISTANCES		
				Vigor	Structure						3xDBH	5xDBH	OTPZ
92	coast live oak	23	30x18	60	20	Poor				Condition: major trunk hollow and decay.	6	9	17
*93	blue oak	33	30x30	60	60	Fair				Neighbor's chain link fence is jogged around the trunk of this tree.	8	14	41
94	coast live oak	17	35x25	80	70	Good				Condition: recommend reduction pruning of co-dominant leaning scaffold/leader.	4	7	8
95	coast live oak	16	30x18	65	40	Fair/Poor				Condition: sweeps underneath adjacent trees.	4	7	8
*96	coast live oak	15,18	45x40	60	60	Fair				Condition: stump sprout.	6	10	18
97	coast live oak	13,18,24	45x45	60	60	Fair				Condition: stump sprout.	10	17	30
98	coast live oak	10,11,13	30x30	50	50	Fair/Poor				Condition: stump sprout with lots of dead branches.	6	10	18
99	coast live oak	17	30x30	50	50	Fair/Poor				Condition: sweeps and very grove-affected. Basal trunk wound and decay.	4	7	8
100	coast live oak	24	30x20	50	40	Poor				Condition: same as above but worse. Only alright to keep if remains in grove.	6	10	18
101	coast live oak	15	40x30	60	50	Fair				Condition: very grove-affected.	4	6	7
102	coast live oak	25	35x40	70	60	Fair					6	10	18
103	coast live oak	14,14	45x30	50	40	Fair/Poor					5	9	15
104	coast live oak	18	50x30	70	60	Fair/Good					4	7	13
105	blue oak	12,13	25x20	50	40	Fair/Poor				Condition: the 12" tree is blue oak (alternate tag number 108), and	5	8	14

Tree #	Species & Common Name	Trunk Diam. @3ft. (in.)	Size	CONDITION		Preservation Suitability	Expected Construction Impact	Action	Reason	Notes	TREE ROOT PROTECTION DISTANCES		
				Vigor	Structure						3xDBH	5xDBH	OTPZ
										the 13" tree is coast live oak (alternate tag number 109). Size of the coast live oak is 35 x20 and its vigor and structure are both 50. These trees are growing very close together, like a single tree.			
106	coast live oak	14	30x20	75	50	Fair					3	6	7
107	valley oak	8	35x15	0	0	Unacceptable				Condition: tree is dead.	3	4	5
***108**	coast live oak	20	35x25	70	60	Fair/Good					5	8	15
***109**	coast live oak	10, 15, 17, 18, 18	50x50	70	50	Fair				Condition: stump sprout with included bark between trunks.	12	20	36
110	coast live oak	13,18,19	45x40	75	60	Fair/Good				Condition: stump sprout.	9	14	26
111	black oak	21,23	60x50	70	50	Uncertain				Condition: both trunks of this stump sprout tree have some decay which should be investigated further. This is a massive tree!	8	14	34
112	valley oak	29	50x50	40	40	Poor				Condition: hardly any secondary branches or live foliage remain on this skeleton of a tree.	7	12	29
113	coast live oak	11	30x30	70	60	Fair					3	4	5
114	coast live oak	21	35x40	80	70	Good					5	9	15
115	coast live oak	15	30x25	70	60	Fair/Good					4	6	7
116	coast live oak	16	28x32	85	70	Good					4	7	8
***117**	coast live oak	8	22x16	85	60	Fair/Good					3	4	5
***118**	valley oak	28	60x40	60	60	Fair/Good					7	12	28

Tree #	Species & Common Name	Trunk Diam. @3ft. (in.)	Size	CONDITION		Preservation Suitability	Expected Construction Impact	Action	Reason	Notes	TREE ROOT PROTECTION DISTANCES		
				Vigor	Structure						3xDBH	5xDBH	OTPZ
*119	coast live oak	40	45x50	80	60	Fair/Good					10	17	40
*120	coast live oak	40	60x50	80	50	Fair/Good					10	17	40
121	coast live oak	10,13,15,15,19	50x40	75	50	Fair				Condition: the 19" trunk may be a separate tree. It is 10" from the stump sprout other trunks. Some of these stump sprout trunk have decay.	11	19	34
122	coast live oak	41	45x60	80	60	Good				Condition: a big, beautiful tree.	10	17	41
123	coast live oak	17,18,18	45x45	70	60	Fair/Good				Condition: stump sprout	9	15	27
124	coast live oak	14,23,27	45x40	75	50	Fair					11	19	34
125	coast live oak	14,15,17,18	35x25	80	40	Fair				Condition: sweeps and jogs due to severe grove affect.	10	17	30
126	coast live oak	10,11,14, 15,15,15,15,19	40x50	75	50	Fair				Condition: stump sprout with central decayed area. There is an operational water faucet at the root collar.	17	28	50
127	coast live oak	20	30x30	85	60	Good					5	8	15
128	coast live oak	18	28x30	85	40	Fair/Poor				Condition: co-dominant scaffold broke, leaving a severe crook in the trunk.	4	7	13
129	coast live oak	18	45*25	70	50	Fair				Condition: LCR (Live Canopy Ratio) of only 40 as this tree is stretching for light through the crowded forest.	4	7	13
130	coast live oak	15	45*25	50	50	Fair/Poor				Condition: same as previous.	4	6	7
131	coast live oak	15	45*20	60	50	Fair				Condition: same as previous.	4	6	7

Tree #	Species & Common Name	Trunk Diam. @3ft. (in.)	Size	CONDITION		Preservation Suitability	Expected Construction Impact	Action	Reason	Notes	TREE ROOT PROTECTION DISTANCES		
				Vigor	Structure						3xDBH	5xDBH	OTPZ
132	coast live oak	14	40*25	75	50	Fair				Condition: same as previous.	3	6	7
*133	coast live oak	11	40*25	60	50	Fair					3	4	5
*134	coast live oak	24	45*30	70	45	Fair/Poor				Condition: large trunk wound, decay and cavity.	6	10	18
135	coast live oak	18	30*25	70	20	Poor	Severe	Remove	Construction, Structure	Construction: very close to or within grading for proposed roadway. Condition: lower trunk has a large cavity removing about half the diameter of the trunk.	4	7	13
136	coast live oak	11	30*20	70	40	Fair/Poor					3	4	5
137	coast live oak	9	20*20	75	70	Fair/Good					3	4	5
138	coast live oak	22	40*35	75	70	Good	Severe	Remove	Construction	Construction: within proposed roadway.	5	9	16
139	coast live oak	8	20*20	75	50	Fair					3	4	5
140	coast live oak	7,7	16*18	60	60	Fair					3	4	5
141	coast live oak	6,7	18*18	80	50	Fair					3	4	5
142	coast live oak	6,3	16*12	70	50	Fair					3	4	5
143	coast live oak	8	15*18	85	50	Fair					3	4	5
144	coast live oak	4,4,8,8	16*18	90	58	Fair					4	7	8
145	coast live oak	21	40*40	70	45	Fair/Poor					5	9	15
146	coast live oak	9	30*18	40	40	Poor				Condition: OK to remain if surrounding grove is undisturbed.	3	4	5
147	coast live oak	27	40*50	70	60	Fair/Good					7	11	20

Tree #	Species & Common Name	Trunk Diam. @3ft. (in.)	Size	CONDITION		Preservation Suitability	Expected Construction Impact	Action	Reason	Notes	TREE ROOT PROTECTION DISTANCES		
				Vigor	Structure						3xDBH	5xDBH	OTPZ
148	coast live oak	21	40*40	75	70	Good	Severe	Remove	Construction/ Structure	Construction: very close to grading for proposed roadway.	5	9	15
149	coast live oak	7,6	20*20	70	40	Fair/Poor	Severe	Remove	Construction/ Structure	Construction: within proposed roadway.	3	4	5
150	*Sambucus nigra caerulea*, blue elderberry	16	40*25	70	60	Fair	Severe	Remove	Construction	Construction: within proposed roadway. Condition: some dead branches but pretty good for an old elderberry shrub/tree.	4	7	20
151	coast live oak	26	45*45	70	60	Good				Construction: within proposed roadway.	6	11	19
152	coast live oak	16,18	40*50	85	50	Fair	Severe	Remove	Construction	Construction: very close to grading for proposed roadway.	6	11	19
153	coast live oak	11	35*20	75	60	Fair				Condition: leans toward corral.	3	4	5
154	coast live oak	11	30*18	80	60	Fair/Good	Severe	Remove	Construction	Construction: very close to or within grading for proposed roadway.	3	4	5
155	coast live oak	9	25*18	70	60	Fair					3	4	5
156	Prunus cerasifera `Atropurpurea', purpleleaf plum	9	22*25	70	40	Fair/Poor				Condition: co-dominant scaffold fork cracked; tree is precariously perched on slope above corral.	3	4	9
*157	coast live oak	22	45*48	85	45	Fair	Severe	Remove	Construction	Construction: this tree is probably within the proposed roadway.	5	9	16
158	coast live oak	15	50*25	75	40	Fair					4	6	7
159	coast live oak	27	45*25	85	50	Fair/Poor	Severe	Remove	Construction	Condition: an interesting tree. Leans significantly upslope. A downslope large buttress root	7	11	20

Tree #	Species & Common Name	Trunk Diam. @3ft. (in.)	Size	CONDITION		Preservation Suitability	Expected Construction Impact	Action	Reason	Notes	TREE ROOT PROTECTION DISTANCES		
				Vigor	Structure						3xDBH	5xDBH	OTPZ
										was cut long ago which may be the reason for the severe lean.			
160	coast live oak	22	50*40	70	60	Good	Severe	Remove	Construction	Construction: very close to or within grading for proposed roadway.	5	9	16
161	coast live oak	32	70*50	70	50	Fair	Severe	Remove	Construction	Construction: within grading for proposed roadway.	8	13	32
162	coast live oak	27	50*40	80	50	Fair					7	11	20
163	coast live oak	21	45*35	80	50	Fair	Severe	Remove	Construction	Construction: within grading for proposed roadway.	5	9	15
164	coast live oak	30	60*50	75	60	Fair/Good	Severe	Remove	Construction	Construction: very close to grading for proposed roadway.	7	12	30
165	coast live oak	20	30*48	70	40	Fair/Poor					5	8	15
166	coast live oak	20,24	60*40	60	50	Fair				Condition: poison oak growing heavily around trunk.	8	14	25
167	coast live oak	9,10	16*15	40	20	Poor				Condition: half the tree is dead.	4	6	7
168	coast live oak	23	40*35	60	40	Fair/Poor				Number out of sync (missed this tree before).	6	9	17
169	coast live oak	19	35*25	70	60	Fair/Good				Number out of sync (missed this tree before). Across from tree #168.	5	8	14

End of Table

** indicates tree trunk was not located on the plans we reviewed; and so we tentatively plotted the tree's location in our tree maps.*

EXPLANATION OF TREE TABLE DATA COLUMNS:

1) **Tree Number** (the field tag number of the existing tree). Each existing tree in the field is tagged with a 1.25 inch round aluminum number tag that corresponds to its tree number referenced in the arborist report, Tree Map, Tree Protection Specifications and any other project plans where existing trees must be shown and referenced.

2) **Tree Name and Type:**
Species: The *Genus* and *species* of each tree. This is the unique scientific name of the plant, for example *Quercus agrifolia* where *Quercus* is the Genus and *agrifolia* is the species. The scientific names of plants can be changed from time to time, but those used in this report are from the most current edition of the *Sunset Western Garden Book* (2012) Sunset Publishing Corporation. The scientific name is presented at its first occurrence in the Tree Table, along with the regional common name. After that only the common name is used.

3) **Trunk diameter (at 3 feet above the ground).** This is the trunk diameter measurement height required by the Town of Los Gatos, in lieu of *DBH*[3]. For multi-trunk trees, trunk diameter is measured for the largest trunk and estimated for all smaller trunks.

4) **Size**: tree size is listed as height x width in feet, estimated and approximate and intended for comparison purposes.

5) **Condition Ratings**: Trees are rated for their *condition* on a scale of *zero to 100* with zero being a dead tree and 100 being a perfect tree (which is rare – like a supermodel in human terms). A 60 is "average" (not great but not terrible either). There are two components to tree condition – ***vigor*** and ***structure***, and each component is rated separately. Averaging the two components is not useful because a very low rating for either one could be a valid reason to remove a tree from a site -- even if the other component has a high rating. Numerically speaking for each separate component:

100 is equivalent to *Excellent* (an `A' academic grade), **80** is *Good* (B), **60** is *Fair* (C), **40** is *Poor* (D), **20** is *Unacceptable* (F) and **0** is *Dead*.

6) Relative to the scope of work for this report, tree *Condition* has been rated but not explained in detail and recommendations for the management of tree condition have not been included. The tree owner may contact Deborah Ellis for additional information on tree condition and specific recommendations for the general care of individual trees relative to their condition.

7) The *Condition* of the tree is considered relative to the tree species and present or future intended use of the site to provide an opinion on the tree's Preservation Suitability Rating (i.e. "Is this tree worth keeping on this site, in this location, as explained in Table 4 on the next page. This is based upon

[3] DBH is tree trunk diameter in inches "at breast height", measured at 4.5 feet above ground level. This is the forestry and arboricultural standard measurement height that is also used in many tree-related calculations.

the scenario that the tree is given enough above and below-ground space to survive and live a long life on the site. Ratings such as "Fair/Good" and "Fair/Poor" are intermediate in nature. The Preservation Suitability rating is not always the same as the Condition Rating because (for example) some trees with poor condition or structure can be significantly improved with just a small amount of work – and it would be worthwhile to keep the tree if this were done.

Table 4 Preservation Suitability Rating Explanation (con

Excellent	Such trees are rare but they have unusually good health and structure and provide multiple functional and aesthetic benefits to the environment and the users of the site. These are great trees with a minimum rating of "Good" for both vigor and structure. Equivalent to academic grade `A'.
Good	These trees may have some minor to moderate structural or condition flaws that can be improved with treatment. They are not perfect but they are in relatively good condition and provide at least one significant functional or aesthetic benefit to the environment and the users of the site. These are better than average trees equivalent to academic grade `B'.
Fair	These trees have moderate or greater health and/or structural defects that it may or may not be possible to improve with treatment. These are "average" trees – not great but not so terrible that they absolutely should be removed. The majority of trees on most sites tend to fall into this category. These trees will require more intensive management and monitoring, and may also have shorter life spans than trees in the "Good" category. Retention of trees with moderate suitability for preservation depends upon the degree of proposed site changes. Equivalent to academic grade `C'.
Poor	These trees have significant structural defects or poor health that cannot be reasonably improved with treatment. These trees can be expected to decline regardless of management. The tree species themselves may have characteristics that are undesirable in landscape settings or may be unsuitable for high use areas. I do not recommend retention of trees with low suitability for preservation in areas where people or property will be present. Equivalent to academic grade `D'.
None	These trees are dead and/or are not suitable for retention in their location due to risk or other issues. In certain settings however, (such as wilderness areas, dead trees are beneficial as food and shelter for certain animals and plants including decomposers. Equivalent to academic grade `F'.

8) **Action (Disposition):**
   a) ***Save***: it should be no problem save this tree utilizing standard tree protection measures.
   b) ***Remove:*** this recommendation is based upon tree condition, preservation suitability, expected impact of construction, poor species for the site or any combination of these factors.
   c) ***Debatable:*** there is a problem with potentially retaining this tree. Find out why in the *Reason* and Notes columns of the Complete Tree Table. Examples are:
      - The tree is shown to be saved (and may be a desirable tree to save) but proposed construction is too close or is uncertain and may cause too much damage to retain the tree. Design changes may be recommended to reduce damage to the tree so that it can be saved.
      - Further evaluation of the tree is necessary (e.g. the tree requires further, more detailed evaluation that is beyond the scope of this tree survey and report. Examples are advanced internal decay detection and quantification with resistance drilling or tomography, a "pull test" to assess tree stability from the roots, or tissue samples sent to a plant pathology laboratory for disease diagnosis.
      - Condition: the tree is in "so-so" or lesser condition and an argument could be made to either save or remove the tree as it stands now. In some cases the owner will make the decision to save or remove the tree based upon the information provided in this report as well as the owner's own preferences.
      - Species: the tree may be a poor species for the area or the intended use of the developed site.
      - Uncertain construction impact
      - Other (as explained for the individual tree)

9) **Reason** (for tree removal or to explain why a tree is listed as "Debatable" or "Uncertain"). Multiple reasons may be provided, with the most significant reason listed first. Reasons can include but are not limited to:
   - ***Construction*** (excessive construction impact is unavoidable and it is not worthwhile to try and save the tree)
   - ***Condition*** (e.g. poor tree condition – either *vigor, structure* or both)
   - ***Landscaping*** (the tree is being removed because it does not fit in with or conflicts with proposed new landscaping)
   - ***Owner's Decision*** (for some reason the owner has decided to remove this tree)
   - ***Species*** (the tree is a poor species for the use of the site)
   - ***Risk*** (the tree presents moderate to excessive risk to people or property that cannot be sufficiently mitigated)

10) **Notes:** This may include any other information that would be helpful to the client and their architects and contractors within the scope of work for this report, such as a more detailed explanation of tree condition or expected construction impact.

11) **Tree Protection Distances** *(See page 35).*

a) Root Protection:

i) **3 and 5xDBH**: Both the 3 and 5xDBH distances are listed for each tree. For multi-trunk trees 100% of the DBH of the largest trunk is added to 50% of the DBH for all other trunks in order to compute the operational DBH to use for these the Tree Protection Distance calculations. For practical purposes, the minimum 3xDBH distance listed is 3 feet and the minimum 5xDBH distance is 4 feet. If disturbance cannot be kept at least 3 feet from the trunk of a tree, the tree should normally be removed.

ii) **OTPZ (Optimum Tree Protection Zone)**: This is calculated as per the text, *Trees & Development*, Matheny et al., International Society of Arboriculture, 1998. This method takes into account tree age and the particular tree species tolerance of root disturbance. Because it may not be possible to maintain the OPTZ distance recommended for trees on many projects due to crowded site conditions, the Arborist may omit this requirement and list only the 3 and 5xDBH distances.

b) Canopy Protection: Additional space beyond root zone protection distances may be necessary for canopy protection.

TREE PROTECTION DISTANCES

3 TO 5 X DBH

No one can estimate and predict with absolute certainty how far a soil disturbance such as an excavation must be from the edge of the trunk of an individual tree to affect tree stability or health at a low, moderate or severe degree -- there are simply too many variable involved that we cannot see or anticipate. 3xDBH however, is a reasonable "rule of thumb" minimum distance (in feet) any excavation should be from the edge of the trunk *on one side of the trunk.* This is supported by several separate research studies including (Smiley, Fraedrich, & Hendrickson 2002, Bartlett Tree Research Laboratories. *DBH* is trunk "diameter at breast height" (4.5 feet above the ground). This distance is often used during the design and planning phases of a construction project in order to estimate root damage to a tree due to the proposed construction. It tends to correlate reasonably well with the *zone of rapid taper*, which is the area in which the large *buttress roots* (main support roots close to the trunk) rapidly decrease in diameter with increasing distance from the trunk. For example, using the 3X DBH guideline an excavation should be no closer than 4.5 feet from the trunk of an 18-inch DBH tree. Such distances are guidelines only, and should be increased for trees with heavy canopies, significant leans, decay, structural problems, etc. It is also important to understand that in actual field conditions we often find that much less root damage occurs than was anticipated by the guidelines. 3xDBH may be more of an aid in preserving tree stability and not necessarily long-term tree health. 5X DBH or greater is the "preferred" minimum distance which should be strived for, and this distance or greater should probably be used when there are multiple trenches on more than one side of the trunk. The roots beyond the zone of rapid taper form an extensive network of long, rope-like roots one to two inches in diameter. These woody perennial roots are referred to as *transport roots* because they function primarily to transport water and minerals. Maintaining a 5xDBH tree protection zone or greater around a tree will preserve more of these transport roots, which will have less of an impact on tree health than if the excavation were closer to the trunk.

OTPZ (OPTIMUM TREE PROTECTION ZONE)

OTPZ is the distance in feet from the trunk of the tree, all around the tree, that construction or other disturbance should not encroach within. If this zone is respected, then chances of the tree surviving construction disturbance are very good. This method takes into account tree age, DBH and the particular species tolerance to root disturbance. Although there are no scientifically based methods to determine the minimum distance for construction (for example, root severance) from trees to assure their survival and stability, there are some guidelines that are often used in the arboricultural industry. The most current guideline comes from the text, Trees & Development, Matheny et al., International Society of Arboriculture, 1998. The tree protection zone calculation method in this text was used to obtain the OTPZ's provided in this report. Due to the crowded, constrained nature of many building sites it is often not be possible to maintain the OPTZ distance recommended for many of the trees -- therefore I have also listed alternate distances of 3 and 5X DBH *(see paragraph above).*

LOS GATOS GENERAL TREE PROTECTION DIRECTIONS

Note that the following is excerpted from Division 2 (Tree Protection) of the Los Gatos Town Code and does not constitute the complete Division 2 text. The owner/applicant is responsible for implementing all pertinent requirements of the Code relative to tree protection.

August 7, 2014

Sec. 29.10.1000 New Property Development

(1) The final approved Tree Preservation Report shall be included in the building permit set of development plans and printed on a sheets titled: Tree Preservation Instruction (Sheet T-1, T-2, etc.). These Sheets shall be referenced on all relevant sheets (civil, demolition, utility, landscape, irrigation) where tree impacts from improvements may be shown to occur.

(3.b.) The site or landscape plans shall indicate which trees are to be removed. However, the plans do not constitute approval to remove a tree until a separate permit is granted. The property owner or applicant shall obtain a protected tree removal permit, as outlined in section 29.10.0980 for each tree to be removed to satisfy the purpose of this definition.

(3.e.) Protective fencing inspection: Prior to issuance of any demolition, grading or building permit, the applicant or contractor shall submit to the building department a written statement verifying that the required tree protection fence is installed around street trees and protected trees in accordance with the Tree Preservation Report.

(3.g.) An applicant with a proposed development which requires underground utilities shall avoid the installation of said utilities within the dripline of existing trees whenever possible. In the event that this is unavoidable, all trenching shall be done using directional boring, air-spade excavation or by hand, taking extreme caution to avoid damage to the root structure. Work within the dripline of existing trees shall be supervised at all times by a certified or consulting arborist.

Section 29.10.1005 Protection of Trees during Construction

a) Protective tree fencing shall specify the following:
   1) **Size and materials**: A five (5) or six (6) foot high chain link fencing, mounted on two-inch diameter galvanized iron posts, shall be driven into the ground to a depth of at least two (2) feet at no more than 10-foot spacing. For paving area that will not be demolished and when stipulated in a tree preservation plan, posts may be supported by a concrete base.

2) **Area type to be fenced.** Type I: Enclosure with chain link fencing of either the entire dripline area or at the tree protection zone (TPZ), when specified by a certified or consulting arborist[4]. Type II: Enclosure for street trees located in a planter strip: chain link fence around the entire planter strip to the outer branches. Type III: Protection for a tree located in a small planter cutout only (such as downtown): orange plastic fencing shall be wrapped around the trunk from the ground to the first branch with 2-inch wooden boards bound securely on the outside. Caution shall be used to avoid damaging any bark or branches.
3) **Duration of Type I, II, III fencing.** Fencing shall be erected before demolition, grading or construction begins and remain in place until final landscaping is required. Contractor shall first obtain the approval of the project arborist on record prior to removing a tree protection fence.
4) **Warning sign.** Each tree fence shall have prominently displayed an 8.5 x 11-inch sign stating: "Warning—Tree Protection Zone-this fence shall not be removed and is subject to penalty according to Town Code 29.10.1025". A template sign has been provided to be used on the project site.

b) All persons, shall comply with the following precautions:
1) **Prior to the commencement of construction, install the fence** at the dripline, or tree protection zone (TPZ) when specified in an approved arborist report, around any tree and/or vegetation to be retained which could be affected by the construction and prohibit any storage of construction materials or other materials or vehicles inside the fence. The dripline shall not be altered in any way so as to increase the encroachment of the construction.
2) **Prohibit excavation, grading, drainage and leveling within the dripline of the tree** unless approved by the director.
3) **Prohibit disposal or depositing of oil, gasoline, chemicals or other harmful materials within the dripline of or in** drainage channels, swales or areas that may lead to the dripline of a protected tree
4) **Prohibit the attachment of wires, signs or ropes** to any protected tree.
5) **Design utility services and irrigation lines** to be located outside of the dripline when feasible.
6) **Retain the services of the certified or consulting arborist for periodic monitoring** of the project site and the health of those trees to be preserved. The certified or consulting arborist shall be present whenever activities occur that pose a potential threat to the health of the trees to be preserved.
7) **The director and project arborist shall be notified of any damage that occurs** to a protected tree during construction so that proper treatment may be administered.

[4] If it is not possible to place Type 1 or Type 2 tree protection fencing at the dripline due to the construction, then place the fencing as far from the trunk as possible, including as much of the dripline as possible, while still allowing for enough room to build improvements. If this happens to be within all or some of the dripline, then so be it. But the contractor must try to fence off as much area under the canopy as possible, do not be irresponsible about this.-

Section 29.10.1010 Pruning and Maintenance

All pruning of protected trees shall be consistent with the current edition of Best Management Practices – Tree Pruning, established by the International Society of Arboriculture (ISA) and any special conditions as determined by the Director. For developments, which require a tree preservation report, a certified or consulting arborist shall be in reasonable charge of all activities involving protected trees including cabling, and fertilizing if specified.

1) **Any public utility installing or maintaining any overhead wires or underground pies or conduits** in the vicinity of a protected tree shall obtain permission from the Director before performing any work, including pruning, which may cause injury to a protected tree (e.g. cable TV/fiber optic trenching, gas, water, sewer trench, etc.)

2) **Pruning for clearance of utility lines and energized conductors** shall be performed in compliance with the current version of the American National Standards Institute (ANSI) A300 (Part 1) - Pruning, Section 5.9 Utility Pruning. Using spikes or gaffs when pruning is prohibited.

TREE PHOTOS

Upper Left: existing driveway to the main house. **Italian stone pine #52** and **coast live oak #53** are labeled.

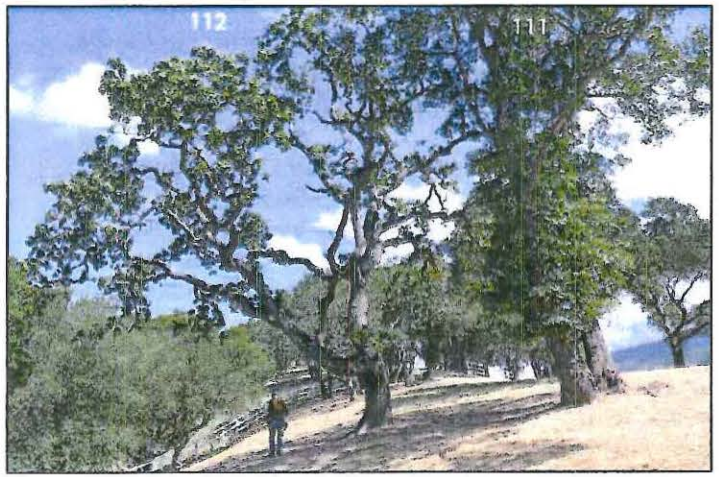
Lower Left: **Monterey pine #63**, it is hard to tell from this photo but about half of the tree is still alive. Three Monterey pines to the left are dead and/or have fallen over.

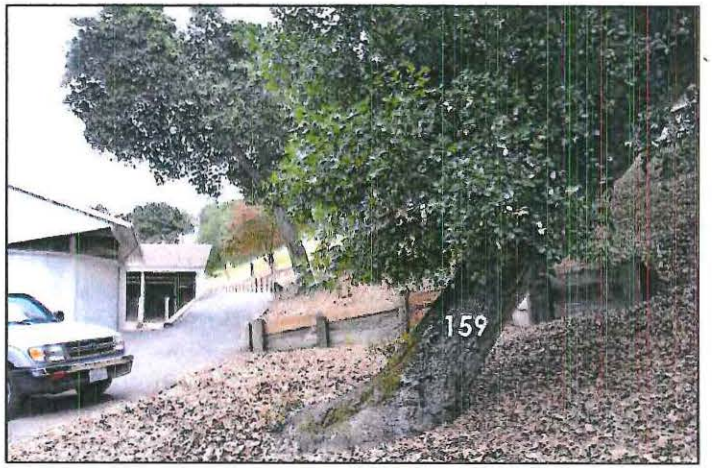
Upper Right: existing driveway to site bordered by large **coast live oaks #59 and 60**.

Upper Left: prominent **coast live oaks #64 and 65**.

Lower Left: nearby **coast live oaks #67 and 68**, not included on the plans but definitely near a proposed building area.

Lower Right: top of the ridge near the west end of the site, with **coast live oaks #77-80**.





Upper Left: **black oak #111 and valley oak #112**. These are both large trees, but the valley oak in particular is not in good condition. The black oak has trunk cavities that should be evaluated in greater detail if the tree may remain.
Lower Left: looking down toward the barn/corral area. **Coast live oak #159** is labeled.

Upper Right: **coast live oak #159**, which leans significantly.
Lower Right: oaks along Santella Drive, at the western end of the site. **Trees #161 and 162** are labeled.

ASSUMPTIONS & LIMITATIONS

1. **Tree locations** were provided by HMH Engineers and are shown on the Tree Map on page 1 of this report. The tree map is a reduced partial copy of the Conceptual Grading Plan that I was given. Tree locations are assumed to be accurate but should be verified in the field.
2. **Thirteen (13) of the trees described in this report were not included on the plans that we were given to review (trees #53,56, 67, 68, 93, 96, 109, 117-120, 133, 134 and 157)** and so we tentatively plotted the approximate locations of these trees on the *Tree Map*. These trees should be accurately surveyed in the field and plotted on the appropriate site-based plans. The trees should then be re-evaluated relative to their estimated expected construction impact.
3. **A *Basic Evaluation* of the subject trees described in this report was performed during May of 2015 for the purpose of this report.** A basic evaluation is a visual evaluation of the tree from the ground, without climbing into the tree or performing detailed tests such as extensive digging, boring or removing samples. This is an initial screening of the tree after which the evaluator may recommend that additional, more detailed examination(s) be performed if deemed necessary.
4. **Trees on neighboring properties were not evaluated.** They were only viewed cursorily from the project site. I did not enter the neighboring property to inspect these trees up close.
5. **Some trees had their root collars and or lower trunks covered** with soil, vegetation or debris and were obstructed from view when I conducted my tree evaluation. If these trees may remain, the obstructions should be removed and I should re-examine these previously covered areas.
6. **I did the best I could at estimating construction impacts to trees based upon the plans, but this is difficult to accomplish with certainty at a scale of 1:50.** We do not have knowledge about the construction methods that will be used on this project and how the site will be staged for construction – these factors can increase or decrease the effect of construction on trees. How heavy equipment will move on the site is another factor we are unaware of – even though trees may not be located close to improvements, they may be located within equipment travel or staging areas. It is possible therefore, that more trees will need to be removed than are presently listed for removal in this report. On the other hand I may have overestimated construction impact in some cases – so that some trees that are listed for removal may not end up having to be removed after all.
7. **Any information and descriptions provided to me for the purpose of my investigation in this case and the preparation of this report are assumed to be correct.** Any titles and ownerships to any property are assumed to be good and marketable. I assume no responsibility for legal matters in character nor do I render any opinion as to the quality of any title.
8. **The information contained in this report covers only those items that were examined** and reflects the condition of those items at the time of inspection.
9. **Loss or removal of any part of this report** invalidates the entire report.
10. **Possession of this report, or any copy thereof, does not imply right of publication** for use for any purpose by any person other than to whom this report is addressed without my written consent beforehand.

11. **This report and the ratings or values represented herein represent my opinion**. My fee is in no way contingent upon the reporting of a specified value or upon any finding or recommendation reported.
12. **This report has been prepared in conformity with generally acceptable appraisal/diagnostic/reporting methods and procedures** and is consistent with practices recommended by the International Society of Arboriculture and the American Society of Consulting Arborists.
13. **My evaluation of the trees that are the subject of this report is limited to visual examination of accessible items without dissection, excavation, probing or coring**. There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the plants or property in question may not arise in the future.
14. **I take no responsibility for any defects in any tree's structure**. No tree described in this report has been climbed and examined from above the ground, and as such, structural defects that could only have been discovered have not been reported, unless otherwise stated. Structural defects may also be hidden within a tree, in any portion of a tree. Likewise, root collar excavations and evaluations have not been performed unless otherwise stated.
15. **The measures noted within this report are designed to assist in the protection and preservation of the trees mentioned herein**, should some or all of those trees remain, and to help in their short and long term health and longevity. This is not however; a guarantee that any of these trees may not suddenly or eventually decline, fail, or die, for whatever reason. Because a significant portion of a tree's roots are usually far beyond its dripline, even trees that are well protected during construction often decline, fail or die. Because there may be hidden defects within the root system, trunk or branches of trees, it is possible that trees with no obvious defects can be subject to failure without warning. The current state of arboricultural science does not guarantee the accurate detection and prediction of tree defects and the risks associated with trees. There will always be some level of risk associated with trees, particularly large trees. It is impossible to guarantee the safety of any tree. Trees are unpredictable.

****

I certify that the information contained in this report is correct to the best of my knowledge, and that this report was prepared in good faith. Thank you for the opportunity to provide service again. Please call me if you have questions or if I can be of further assistance.

Sincerely,

Deborah Ellis

Deborah Ellis, MS.
Consulting Arborist & Horticulturist
Certified Professional Horticulturist #30022
ASCA Registered Consulting Arborist #305
I.S.A. Board Certified Master Arborist WE-457B
I.S.A. Tree Risk Assessment Qualified

Enclosures:

- *Living among the Oaks – a Management Guide for Landowners.* Johnson. University of California Cooperative Extension, Natural Resources Program. No date. For the property owner.
- *Los Gatos General Tree Protection Directions*
- Los Gatos tree protection sign template

GLOSSARY

1. **Arborist, Project. The arborist who is appointed to be in charge of arborist services for the project.** That arborist shall also be a *qualified consulting arborist* (either an International Society of Arboriculture (ISA) Board-Certified Master Arborist or an American Society of Consulting Arborists (ASCA) Registered Consulting Arborist) that has sufficient knowledge and experience to perform the specific work required. For most construction projects that work will include inspection and documentation of tree protection fencing and other tree protection procedures, and being available to assist with tree-related issues that come up during the project.
2. **Arborist, Qualified Consulting:** must be either an International Society of Arboriculture (ISA) Board-Certified Master Arborist or an American Society of Consulting Arborists (ASCA) Registered Consulting Arborist that has sufficient knowledge and experience to perform the specific work required.
3. **Boundary Line Tree**: a tree who's trunk (where the trunk is attached to the ground) straddles the property line between two or more properties. Such a tree is owned jointly by those properties on a percentage basis, depending upon the percentage of the trunk that is located on each property. Permission of co-owners is generally required for removal of the tree, and often pruning or other tree work or actions that affect the tree.
4. **Buttress roots**: the large roots emerging from the base of the trunk; the trunk flare. Buttress roots support the entire tree and help to equalize mechanical stress.
5. **Co-dominant** refers to two leaders, branches or trunks that arise at the same point on a tree and are about the same diameter. This is an undesirable structural defect that is a weak point in the tree. Co-dominant stems typically lack the overlapping tissue present in a branch or trunk collar, which may be why trees with this defect split so easily. Included bark between members also reduces the strength of the union. It is best that branches or trunks originate with space between them, or if they arise at the same point that they be of different sizes. Co-dominant leaders can often be corrected (one leader removed) when trees are young. When trees are older it is often better to subdue the smaller or more undesirable member by reducing the length of and/or thinning the terminal half of the foliage by 25% to slow its growth and ultimate size relative to the other member, rather than create a large wound by removing one of the members. Large wounds are much more subject to decay than are smaller wounds and there is no natural decay barrier between the members.
6. **Crooks** are unnatural bends or sharp angles in branches or trunks caused by the removal of other attached branches or trunks; often with a vertical growing side branch at the end. This concentrates weight at the end of the branch, and also over some inevitable decay from a pruning wound.
7. **Dieback:** the abnormal and premature death of branches, usually in the upper or more terminal portions of a tree or woody plant. Generally the smaller diameter branches die first, and the dieback may extend downward and/or to larger branches. Branch dieback is generally a symptom of stress some underlying problem with the plant, such as root disease or an unfavorable environment. The plant is "downsizing" to deal with this problem.
8. **Dripline**: the area under the total branch spread of the tree, all around the tree. Although tree roots may extend out 2 to 3 times the radius of the dripline, a great concentration of active roots is often in the soil directly beneath this area. The dripline is often used as an arbitrary "tree protection zone".

9. **Epicormics**: secondary, upright vegetative shoots arising from just beneath the bark of the trunk or branches of a plant, also called *watersprouts*. They are usually weakly attached because they are not anchored deeply inside the parent member, as are branches of normal growth. Excessive epicormics can be a symptom of tree distress – the tree is trying to make up for the loss of food-manufacturing tissue from excessive pruning, disease or insect infestation.
10. **Grove**: is a group of trees that located close together that shelter each other from wind and the elements, having "knit" canopies. If of the same species, there is usually root grafting between trees, which lends support from the ground, as well as water and mineral sharing. Removal of one or some grove members could cause remaining members to be unstable due to a reduction of previous shelter. Grove trees often have asymmetrical canopies when viewed as individuals.
11. **Included bark** is bark sandwiched between adjacent branches, a branch and the trunk, or two or more trunks, often appearing as a seam. In contrast, a normal attachment will have a ridge of bark protruding upwards and a continuous wood connection between adjacent members. An included bark branch or trunk attachment is weaker than a normal attachment. As branches or trunks with included bark grow, they expand in diameter, squeezing the bark along the seam. This may kill some portion of the included bark. When this occurs, a wound response is initiated. As a consequence, cracks can be generated, leading to breakage. Such defects can often be completely removed when a tree is young (e.g. the offending members equal or less than 2 inches in diameter). Older, larger cuts (such as 6 inches in diameter or more) could cause decay to spread into the remaining member, which is undesirable. In these cases it may be best to thin one member (usually the smaller member) by 25% to slow its growth and ultimate size.
12. **Leader**: the primary terminal shoot or trunk of a tree.
13. **Root collar & root collar excavation and examination**: The *root collar* (junction between trunk and roots) is critical to whole-tree health and stability. A root collar excavation carefully uncovers this area (with hand digging tools, water or pressurized air). The area is then examined to assess its health and structural stability. Buttress roots may be traced outward from the trunk several feet. Decay assessment of the large roots close to the trunk (buttress roots) involves additional testing such as drilling to extract interior wood with a regular drill, or the use of a resistance-recording drill to check for changes in wood density within the root; as would be caused by decay or cavities. It is important to note that root decay often begins on the underside of roots, which is not detectable in a root collar excavation unless the entire circumference of the root is excavated and visible. Drill tests may detect such hidden decay. Note that it is not possible to uncover and evaluate the entire portion of the root system that is responsible for whole-tree stability. Decayed roots that are inaccessible (e.g. underneath the trunk) can be degraded to the extent that the whole tree may fail even though uncovered and examined roots in accessible locations appear to be sound.
14. **Root grafting** between trees of the same or very closely related species occurs when roots contact and press against each other. Such roots eventually develop a vascular connection so that water and nutrients are shared between the trees.
15. **Scaffold branch**: a primary structural branch arising from the trunk of a tree. Usually the largest and often the lowest branches of the tree.
16. **Stump sprout trees** are the result of a tree trunk being cut down to a short stump close to the ground. If the tree survives, it sends out many small shoots (suckers) from around the cut stump. Some of these suckers may survive and grow to become significant trunks. These trunks are spaced very close together and usually have included bark between them, which reduces the strength of their union. Such trunks are prone to failure. Stump sprout trees can be very structurally unsound, particularly as they become large and old. There is often a great deal of decay associated with the mother stump, which can also reduce mechanical stability.

17. **Suckers** are secondary upright shoots arising from the roots or root collar (junction between roots and trunk) of a tree, or below the graft union. On a grafted tree the suckers (originating from the *stock* which includes the roots), are often not the same plant species as the *scion* (the grafted, desirable aboveground part). Suckers can be a nuisance in landscape situations. In nature however, suckers can serve to keep a tree alive after fire or mechanical damage that kills or removes the aboveground part of the tree.
18. **Sudden Oak Death (SOD)** is a potentially lethal water and airborne fungal disease of tan oak (*Lithocarpus densiflorus*) coast live oak (*Quercus agrifolia*) and several other native and non-native tree and shrub species. California bay tree (Umbellularia californica) is a major spreader of the disease to susceptible oak trees. Learn more about this disease from the California Oak Mortality Web Site, http://www.suddenoakdeath.org/.
19. **Summer Dry**: Our native oak species are adapted to our "summer dry" climate. When the soil in their root system is kept moist during our normally dry months, these oaks are predisposed to attack by fungal root rot pathogens that are usually present in our soils. Therefore it is important to keep irrigation as far from the tree trunk (preferably beyond the mature dripline) as possible. The best landscape treatment underneath native oaks is non-compacted soil covered with a 3 to 4-inch depth of oak wood, leaf and twig litter (the tree's natural litter). Keep this mulch 6 to 12 inches away from the root collar (junction of trunk and roots). An exception to the no summer water rule would be newly planted oaks (for the first 2 to 3 years after planting, until they are "established") and also during droughts that occur during the normal rainy season.
20. **Sunscald** is the death of bark, and sometimes the underlying wood, due to the heat of the sun. This often occurs when over-pruning removes a large amount of foliage, newly exposing previously sheltered tissue.
21. **Tomography (tomographic scanning of trees)**: Tomography is a method of imaging the interior of an object by sending invisible waves (sound, magnetic, x-ray, etc.) through it. The changes that the waves experience as they pass through the object provide data, which through mathematical algorithms is translated into a two-dimensional color-coded image. Interpretation of the image provides information on the mechanical and sometimes chemical properties of the interior of the object. A common type of tomography used for medical imaging is the MRI scan, which uses magnetic waves. For trees, sonic (sound wave) and electric resistance tomography are used to investigate the interior of trunks and large branches. Sonic tomography measures wood density and electric resistance tomography measures hydration and other chemical properties of the wood. Sonic and electric resistance tomographies used together provide more and higher quality information than either method used alone. Deborah Ellis provides tree tomography services to clients; information on this technology is available on her web site at: http://www.decah.com/picus.html
22. **Tree Service, Qualified**: A tree service is a company that performs tree pruning and tree removals as their main business. A *Qualified Tree Service* is a tree service with a supervising arborist who has the minimum certification level of ISA (International Society of Arboriculture) Certified Arborist and acts in a supervisory position on the job site during execution of the tree work. The tree service shall have a State of California Contractor's license for Tree Service (C61-D49) and provide proof of Workman's Compensation and General Liability Insurance. The person(s) performing the tree work must adhere to the most current of the following arboricultural industry tree care standards:
    - *Best Management Practices, Tree Pruning*. 2008. International Society of Arboriculture, PO Box 3129, Champaign, IL 61826-3129. 217-355-9411
    - *ANSI A300 Pruning Standards*. 2008 Edition. Ibid. (Covers tree care methodology).
    - *ANSI Z133.1 Safety Requirements for Arboricultural Operations*. 2006 Edition. Ibid. (Covers safety).

LOS GATOS GENERAL TREE PROTECTION DIRECTIONS

Note that the following is excerpted from* Division 2 *(Tree Protection) of the Los Gatos Town Code and does not constitute the complete Division 2 text. The owner/applicant is responsible for implementing all pertinent requirements of the Code relative to tree protection.

August 7, 2014

Sec. 29.10.1000 New Property Development

(1) The final approved Tree Preservation Report shall be included in the building permit set of development plans and printed on a sheets titled: Tree Preservation Instruction (Sheet T-1, T-2, etc.). These Sheets shall be referenced on all relevant sheets (civil, demolition, utility, landscape, irrigation) where tree impacts from improvements may be shown to occur.

(3.b.) The site or landscape plans shall indicate which trees are to be removed. However, the plans do not constitute approval to remove a tree until a separate permit is granted. The property owner or applicant shall obtain a protected tree removal permit, as outlined in section 29.10.0980 for each tree to be removed to satisfy the purpose of this definition.

(3.e.) Protective fencing inspection: Prior to issuance of any demolition, grading or building permit, the applicant or contractor shall submit to the building department a written statement verifying that the required tree protection fence is installed around street trees and protected trees in accordance with the Tree Preservation Report.

(3.g.) An applicant with a proposed development which requires underground utilities shall avoid the installation of said utilities within the dripline of existing trees whenever possible. In the event that this is unavoidable, all trenching shall be done using directional boring, air-spade excavation or by hand, taking extreme caution to avoid damage to the root structure. Work within the dripline of existing trees shall be supervised at all times by a certified or consulting arborist.

Section 29.10.1005 Protection of Trees During Construction

a) Protective tree fencing shall specify the following:
   1) **Size and materials**: A five (5) or six (6) foot high chain link fencing, mounted on two-inch diameter galvanized iron posts, shall be driven into the ground to a depth of at least two (2) feet at no more than 10-foot spacing. For paving area that will not be demolished and when stipulated in a tree preservation plan, posts may be supported by a concrete base.
   2) **Area type to be fenced**. Type I: Enclosure with chain link fencing of either the entire dripline area or at the tree protection zone (TPZ), when specified by a certified or consulting arborist[1]. Type II: Enclosure for street trees located in a planter strip: chain link fence around the entire planter strip to the outer branches. Type III: Protection for a tree located in a small planter cutout only (such as downtown): orange plastic fencing shall be wrapped around the trunk from the ground to the first branch with 2-inch wooden boards

[1] If it is not possible to place Type 1 or Type 2 tree protection fencing at the dripline due to the construction, then place the fencing as far from the trunk as possible, including as much of the dripline as possible, while still allowing for enough room to build improvements. If this happens to be within all or some of the dripline, then so be it. But the contractor must try to fence off as much area under the canopy as possible, do not be irresponsible about this.

bound securely on the outside. Caution shall be used to avoid damaging any bark or branches.

3) **Duration of Type I, II, III fencing**. Fencing shall be erected before demolition, grading or construction begins and remain in place until final landscaping is required. Contractor shall first obtain the approval of the project arborist on record prior to removing a tree protection fence.

4) **Warning sign**. Each tree fence shall have prominently displayed an 8.5 x 11-inch sign stating: "Warning—Tree Protection Zone-this fence shall not be removed and is subject to penalty according to Town Code 29.10.1025". A template sign has been provided to be used on the project site.

b) <u>All persons, shall comply with the following precautions</u>:

1) **Prior to the commencement of construction, install the fence** at the dripline, or tree protection zone (TPZ) when specified in an approved arborist report, around any tree and/or vegetation to be retained which could be affected by the construction and prohibit any storage of construction materials or other materials or vehicles inside the fence. The dripline shall not be altered in any way so as to increase the encroachment of the construction.

2) **Prohibit excavation, grading, drainage and leveling within the dripline of the tree** unless approved by the director.

3) **Prohibit disposal or depositing of oil, gasoline, chemicals or other harmful materials within the dripline of or in** drainage channels, swales or areas that may lead to the dripline of a protected tree

4) **Prohibit the attachment of wires, signs or ropes** to any protected tree.

5) **Design utility services and irrigation lines** to be located outside of the dripline when feasible.

6) **Retain the services of the certified or consulting arborist for periodic monitoring** of the project site and the health of those trees to be preserved. The certified or consulting arborist shall be present whenever activities occur that pose a potential threat to the health of the trees to be preserved.

7) **The director and project arborist shall be notified of any damage that occurs** to a protected tree during construction so that proper treatment may be administered.

<u>Section 29.10.1010 Pruning and Maintenance</u>

All pruning of protected trees shall be consistent with the current edition of Best Management Practices – Tree Pruning, established by the International Society of Arboriculture (ISA) and any special conditions as determined by the Director. For developments, which require a tree preservation report, a certified or consulting arborist shall be in reasonable charge of all activities involving protected trees including cabling, and fertilizing if specified.

1) **Any public utility installing or maintaining any overhead wires or underground pies or conduits** in the vicinity of a protected tree shall obtain permission from the Director before performing any work, including pruning, which may cause injury to a protected tree (e.g. cable TV/fiber optic trenching, gas, water, sewer trench, etc.)

2) **Pruning for clearance of utility lines and energized conductors** shall be performed in compliance with the current version of the American National Standards Institute (ANSI) A300 (Part 1) - Pruning, Section 5.9 Utility Pruning. Using spikes or gaffs when pruning is prohibited.

University of California Agriculture and Natural Resources

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LIVING AMONG THE OAKS

A Management Guide for Woodland Owners and Managers

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University of California Oak Woodland Conservation Workgroup

What is more characteristic of the California landscape than the oak? Round-crowned oaks dapple the rolling hills, solitary monarchs shade our rural roads, and valley giants stretch skyward in banners of leaves and lichen. Both past and present-day travelers have stopped in awe of our native oaks, and countless photographs and memories are framed by their spreading, weather-worn branches. The oak is particularly emblematic of the inland regions of California, where scattered oaks, rolling pastures, and distant cattle are common elements of an infinitely variable and ever-changing landscape.

In this region—often called the hardwood range or oak woodlands by land managers—the vistas of oaks, pasture, and livestock bestow a tranquility that sometimes belies the fourth element: people. Like the earliest Californians, people today come to the oak woodlands for food, shelter, and beauty. Many consider oak woodlands a landscape of California that symbolizes values we hold dear—strength, beauty, adaptability, and longevity.

But intensifying land use in oak woodlands has brought problems along with it: soil erosion, reduced forage production, poor regeneration for some oak species, and degraded wildlife habitats. Oak woodlands today are clearly showing the effects of the last 200 years of human habitation.

Oaks provide

- shade and shelter
- wildlife and fisheries habitat
- soil protection (erosion control)
- increased property values
- beautiful landscapes
- food and fuel
- recreational opportunities

All Californians can assist in the protection and enhancement of native oak resources, but nobody is in a better position to do so than the owners and managers of oak woodlands. Those who own homes or property in the oak landscape can help shape the future by their decisions, which collectively direct the management and land use of more than 7 million acres (2.8 million hectares) of the state. This publication is designed primarily for the owners of home lots or small acreages, but owners and managers of larger properties can also apply much of the information, especially to areas where native oaks grow around the ranch home. It brings together helpful information about living—and making a living—among the oaks. The University of California Oak Woodland Conservation Workgroup hopes that you will find this information useful as you manage your land and make decisions that shape the future of California's oaks and oak woodlands.

Oaks of the Hardwood Range

California has 21 native species of oak in the genus Quercus, 10 of which grow to tree size. Of these, 8 are conspicuous members of the oak woodland plant community. All are relatively slow growing and long lived.

Valley oak *(Q. lobata)*

Alice B. Addicott

This tall, spreading, winter-deciduous oak was once an important member of the Central Valley's riparian forests, but agricultural conversions and development have greatly reduced the acreage it occupies. From Shasta County to Los Angeles County, it is still a conspicuous oak in the landscape, especially in valley bottoms and on deep alluvial soil. It is the largest oak in California.

Blue oak *(Q. douglasii)*

Hart Gordon Bailey

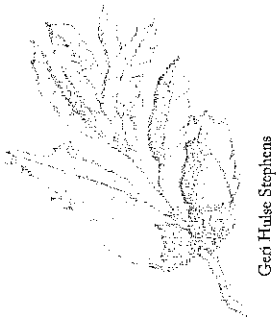
This deciduous oak is the dominant oak in the woodlands from Shasta County to Kern County, growing in the foothills of the Sierra Nevada, Coast, and Transverse mountain ranges. It often grows in association with interior live oak (Q. wislizeni) and foothill pine (Pinus sabiniana) and tolerates relatively harsh sites. In addition to dropping its leaves in winter, it exhibits drought deciduousness—that is, the capacity to shed foliage earlier than normal in response to drought.

Coast live oak *(Q. agrifolia)*

Hart Gordon Bailey

This evergreen oak occurs from southern Mendocino County southward into northern Baja California, primarily in the Coast Range. On favorable sites it often attains a rounded, spreading appearance. It is a member of the black oak subgenera and is one of four California oak species that is susceptible to Sudden Oak Death.

Interior live oak *(Q. wislizeni)*



Geri Hulse Stephens

This evergreen oak is widely This evergreen oak is widely distributed in California from Siskiyou County south to Baja California. It is abundant in the Sierra Nevada foothills, and in the Coast Range it occupies higher, drier, and more inland sites than does coast live oak. It is generally found in more heavily wooded sites than blue oak, and in chaparral habitats or other dry locations it often develops a shrubby form.

Engelmann oak *(Q. engelmannii)*

Hart Gordon Bailey

This semideciduous oak has a narrow distribution, primarily in western San Diego County, where it replaces blue oak as the dominant species. It has been severely impacted by agricultural conversions and, along with blue oak and valley oak, is not regenerating well.

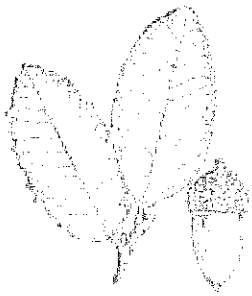
California black oak *(Q. kelloggii)*

This species is a member of the black oak subgenera and loses its leaves in winter. It most commonly grows in mountainous areas, and in the Sierra Nevada it is an important component of the mixed-conifer forests. It typically receives more than 25 inches (64 cm) of annual precipitation and produces a strong reddish-brown wood that is compared to northern red oak (Q. rubra). Its acorns were considered the best tasting by many tribes of Native Americans throughout the state.

Oregon white oak *(Q. garryana)*

This deciduous white oak is common in northern California and extends far north, all the way to Vancouver Island in British Columbia. It prefers a moderate climate with warm summers and freezing winters and between 20 and 50 inches (51 and 128 cm) of precipitation. In California it grows in a variety of habitats and is often associated with bay laurel (Umbellularia californica), Douglas fir (Pseudotsuga menziesii), black oak, Pacific madrone (Arbutus menziesii), and tanoak (Lithocarpus densiflorus).

Canyon live oak *(Q. chrysolepis)*



This evergreen species has a broad distribution, extending from Oregon to Baja California, and it can grow from sea level to high in the mountains. The wood is very strong and close grained and was originally used for tools and implement handles; hence one of its common names is maul oak. Another common name is gold cup oak, because it has fine yellow powder covering the acorn cup, or cap.

Source: McMinn, Maino, and Shepherd 1935.

Courtesy of the UC Davis Arboretum

Needs and Conflicts

In designing and building homes, gardens, orchards, and places for animals, your decisions are shaped by your overall objectives for your land. Whether your land is a residential site, used for grazing, or maintained as natural open space, you will need to consider various management options. As you choose management approaches for your land, also take into account your oak trees and evaluate whether or not your planned activities are compatible with oak conservation and the basic needs of the trees. Remember that well-managed oak woodlands can also help enhance other natural resources, such as soil and water. Careful planning and design can often provide benefits for both people and oaks.

Past development among the oaks has revealed specific areas of conflict. Often impacts to oaks have not been adequately addressed in planning documents and mitigation requirements. But a 2004 California state law (Public Resources Code § 21083.4) requires mitigation if projects in oak woodlands have significant impacts on the environment. It has also become apparent that, in addition to the removal of trees, certain construction practices can seriously injure or kill oaks. Construction activities can increase (or decrease) fire hazards, creating liability and management problems. Gardening practices such as amending the soil, planting lawns, or irrigating under established oaks can damage them. Domestic animals, as well as insect and disease pests, also can take a toll. In combination, these elements can present formidable obstacles to the health and survival of oak trees. However, harmful effects can be minimized by thoughtful management practices. And how we manage oak woodlands will likely become even more critical under the stresses associated with climate change.

Building around Oaks: Protecting the Root Zone

The most vulnerable part of a mature oak tree is the root system and, in particular, the root crown at the base of the trunk. Although most oaks do have a deep taproot, many oak roots are relatively shallow and extend outward from the root crown, reaching some distance beyond the tree's drip line (the outermost edge of a tree's foliage). For management purposes, think of a tree's root zone as extending out at least one-third farther than the distance to the drip line. Ideally there should be no disturbance within this zone. This means no grading, digging, trenching, using of fill soils, covering the ground with asphalt or concrete, or landscaping with plants that require more than two or three summer waterings. Also, excessive foot traffic, operating heavy equipment, and parking vehicles (particularly heavy ones) should be avoided in this zone to avoid compaction. It is preferable to retain natural litter (fallen leaves, twigs, and bark) or add mulch to cover the soil surface. If modifications are unavoidable, strive to keep this area in as natural a condition as possible, and keep ground disturbance as far away from a tree's trunk as possible.

Threats to the Root Zone

The following human activities are the ones that most commonly alter a tree's root environment, potentially damaging or killing it.

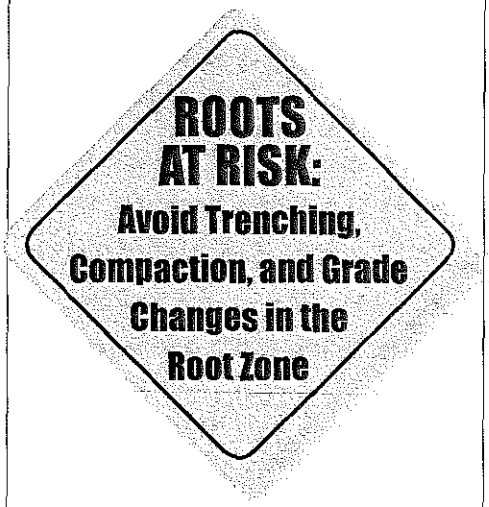
Changes in grade. This includes any changes in the ground level under the tree, either by mounding up soil or removing it. Excavating soil can directly cut and destroy roots and expose them to damage from surface activities. Mounding up soil can reduce oxygen to the roots. Depending on climate and soil moisture, additions of soil can also encourage root rots. Use retaining walls outside of the drip line to protect the natural grade under the tree. If there is no alternative to adding soil within the drip line, consult a qualified arborist specializing in oaks for strategies to minimize injury. Also, review the publications listed in the "References" section.

Changes in drainage. Irrigation and changes in the drainage around an oak can result in water in the root zone during the summer when soil temperatures are high and soils are normally dry. This can promote the

proliferation of harmful soil microorganisms that injure roots. Saturated soils can also inhibit oxygen movement into the root zone. These factors can ultimately result in tree death.

Soil compaction. Heavy foot traffic or the operation of heavy equipment can cause soil compaction, especially when the soil is wet. Compaction causes the spaces between soil particles to become compressed, reducing gas exchange. Since gas exchange is needed for root function, compaction can cause significant injury to oaks. When the ground is covered with nonporous materials such as asphalt or concrete, the free passage of moisture, air, and other gases within the root zone is impeded. In addition, soil compaction can occur in preparation for and during paving. As an alternative to common paving materials (asphalt and concrete), there are porous materials that are more compatible with the oak environment and make excellent ground coverings. Regardless of the permeability of the ground covering, nothing should be placed within a 6-foot (1.8 m) radius of a tree's trunk. This is the minimum area that should always be left undisturbed and preferably covered with mulch.

Trenching. Trenching is a leading cause of tree mortality. When utility trenches are dug into the root zone, major portions of a tree's root system may be cut or damaged. When several large roots are damaged, tree death may follow. Trenching in the root zone should be avoided whenever possible. If trenching cannot be avoided, identify the location of lateral roots using a pneumatic trenching tool. Probably the best alternative to trenching is to place utilities in a conduit that is bored through the soil. If utility conduits are unavailable, try to have all utilities placed in a single trench, as multiple trenching causes greater damage.



Disturbance beyond the root zone. Beyond the root zone mature oaks are usually less affected by landform and drainage changes, soil compaction, paving, and trenching activities. But indirect effects must still be considered. Avoid fill materials that could alter flow patterns, resulting in water collecting around trees. Consider the effects of nearby ponds or swimming pools on local soil moisture, and watch for bank or hillside cuts that could alter drainage patterns.

Fire in California's Oak Woodlands

Californians are keenly aware that fires regularly occur in our state and can have devastating consequences. Recently there have been some catastrophic fires in oak woodlands. The severity of these fires was partially due to fire suppression activities during the last 100 years that have increased fuel loads and made it more difficult to suppress or contain woodland fires that do start, especially during extreme fire weather. Also, more people are now living within these fire-prone ecosystems, which complicates fire-fighting activities. One consequence of the recent spate of fires was the revision of the California state law that requires fuel reductions around homes and the removal of vegetation that could help fires spread (Public Resources Code § 4291). Increasing clearances and removing "ladder fuels" can greatly reduce the risk that homes in the paths of fires will be lost.

Once the fires have passed and the embers have cooled, property owners want to know if their oaks have been killed. Often they haven't been. Even if all of the leaves on an oak tree have been scorched and the tree looks dead, new leaves will often emerge and start to grow the following spring—or even sooner—and the tree may suffer little long-term damage. It is therefore important to wait until the following year to determine if trees have been killed from fire. And even if the aboveground trunk has

Native Plants Compatible with Oaks

Below is a selection of California native plants that require little water and can therefore be used in landscaping under and around oak trees. Once established—usually after a year—they require little care, minimal water, and offer beautiful foliage. Sometimes they have showy blossoms with pleasant fragrances as well. When planting near oaks, avoid injury to roots while digging planting holes, and stay outside the drip line if possible. Also add mulch after planting to help conserve soil moisture.

Shrubs (partial shade)

Carpenteria californica, carpenteria
Ceanothus spp., wild lilacs:
C. griseus, C. thysriflorus,
C. maritimus, plus cultivars:
C. Joyce Coulter, *C.* Ray Hartman.
Cercis occidentalis, western redbud
Cercocarpus betuloides, mountain-mahogany
Eriogonum arborescens, Santa Cruz Island wild buckwheat
Garrya elliptica, silk-tassel bush
Heteromeles arbutifolia, toyon
Mahonia spp., barberries and mahonias:
M. dictyota, M. fremontii,
M. haematocarpa, M. pinnata
Prunus ilicifolia, holly-leaf cherry
Rhamnus californica, coffeeberry
Ribes spp., gooseberries:
R. aureum var. *gracillimum,*
R. malvaceum,
R. speciosum, R. sanguinium,
R. viburnifolium
Rosa californica, California wild rose
Rosa californica, Plena, double California rose
Salvia clevelandii, San Diego wild sage
Salvia leucophylla, coastal white sage

Shrubs (full sun)

Fremontodendron californicum,
F. mexicanum and cultivars, Fremontia, flannel bush, California Glory, Pacific Sunset
Galvezia speciosa, island snapdragon
Lupinus albifrons, silver bush lupine
Lupinus chamissonis, Chamisso bush lupine
Mimulus aurantiacus, bush monkey flower
Mimulus puniceus, red monkey flower
Penstemon clevelandii, Cleveland's penstemon, and other species
Romneya coulteri, matilija poppy

Ground covers

Baccharis pilularis ssp. *pilularis,* dwarf coyote bush
Ceanothus griseus var. *horizontalis,* Carmel creeper
Ceanothus maritimus, Hoover ceanothus
Ribes viburnifolium, Catalina currant

Evergreen herbaceous plants

Dryopteris arguta, wood fern
Eriogonum umbellatum var. *polyanthum,* buckwheat
Heuchera maxima, giant alum root
Iris douglasiana and hybrids
Viguiera deltoidea var. *parishii*

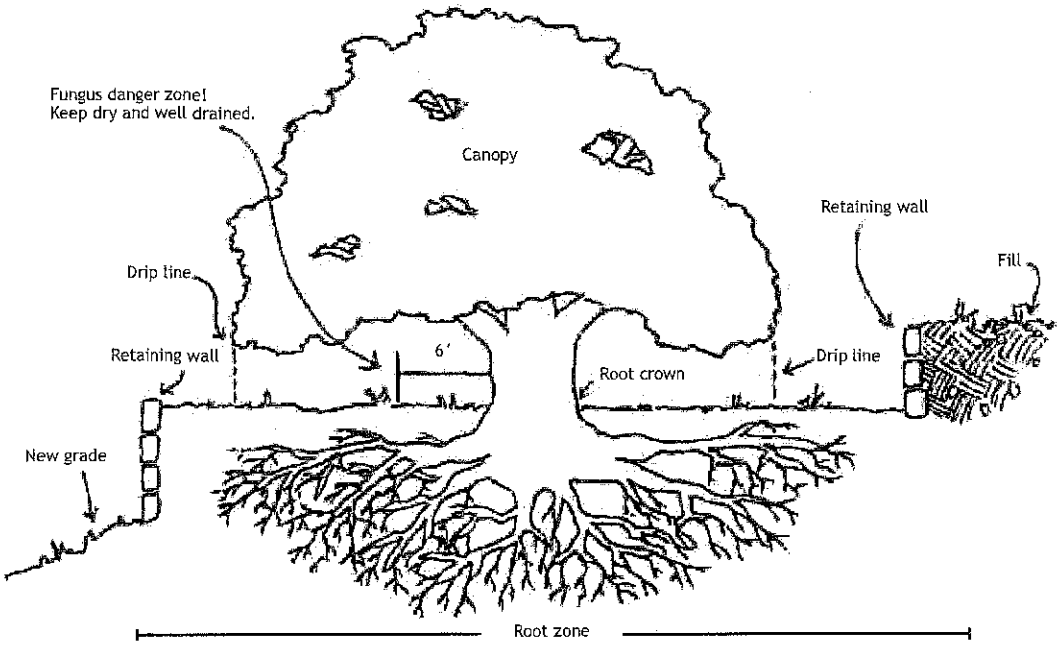
Deciduous or annual herbaceous plants

Clarkia spp., clarkias
Collinsia spp., Chinese houses
Dodecatheon clevelandii, shooting stars
Eschscholzia spp., poppies
Montia perfoliata, miners lettuce
Nemophila menziesii, baby blue eyes
Oenothera spp., evening primroses
Sisyrinchium bellum, blue-eyed grass
Viola pedunculata, yellow pansy
Zauschneria californica, California wild fuchsia

Bulbs

Brodiaea species and related genera:
Dichelostemma pulchellum
Triteleia laxa
Calochortus spp., Mariposa lilies
Chlorogalum pomeridianum, soap plant
Lilium pardalinum, leopard lily
Trillium chloropetalum, common trillium

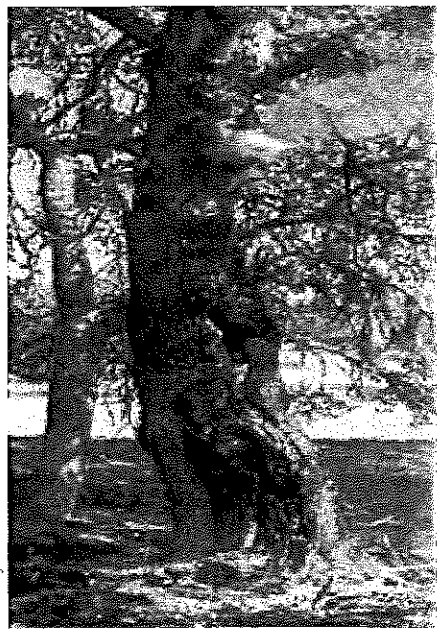
For more information about these and other California native plants compatible with oak gardens, including which species are native to your part of California, contact local arboreta, botanical gardens, and the California Native Plant Society (see "Online Resources").



It is essential to limit activities in the root zone that could damage the tree's roots.

Concept courtesy of Sacramento County Office of Education

been so severely damaged that the tree dies and has to be cut down, oaks will generally sprout from their stump. These sprouts can eventually grow into a new tree, and much more quickly than when planted as acorns. While fires are generally not good for trees, oaks have evolved in an environment where regular fires have always occurred. As a result, they are well adapted to survive this natural phenomenon.



Bill Tietje

Fire in California's oak woodlands is an ongoing threat.

Oak Pests

Oaks in natural settings are relatively resistant to severe damage from pests, especially native pests that have co-evolved with oaks (but see the section on Sudden Oak Death, below). However, when compromised by soil compaction, changes in soil moisture, or other disturbances, trees can have difficulty fending off organisms that cause injury. In some cases, by the time symptoms appear, the tree is declining and remedies may be too late. A qualified arborist should be called when the following symptoms are noticed:

- Loss of tree vigor, twig dieback and wilting, abnormally yellowish leaves, and wounds on the bark that ooze rust-colored fluid. These symptoms are indicators of crown rot (*Phytophthora* spp.).
- Foliage turning brown, and the oozing of a dark brown, viscous fluid from the trunk. These symptoms are often accompanied by the presence of bark beetles and fruiting bodies of Hypoxylon fungus on the trunk of the tree. These are symptoms of *Phytophthora ramorum*, the agent responsible for Sudden Oak Death (see below).
- Dieback of branches, emergence of honey-colored mushrooms at or near the base of the tree in the early winter, often accompanied by a white fan-shaped fungus growth between the bark and sapwood, and black shoestringlike structures in the soil. These are indicators of a serious disease called oak root fungus, *Armillaria mellea.*

Armillaria is often present on the roots of wildland oaks, even when there are no obvious outward symptoms. Under natural conditions this disease is rather benign, and it is held in check by summer drought. However, *Armillaria* thrives in warm, moist conditions—a situation that is created when the area under a tree is watered during the summer. Once the roots of a tree are seriously infected, the fungus can persist in soil organic material for many years and can later infect other trees—even after the death and removal of the host plant. Fruit trees and landscape plants nearby, particularly those that are irrigated during the summer, may also be subject to infections.

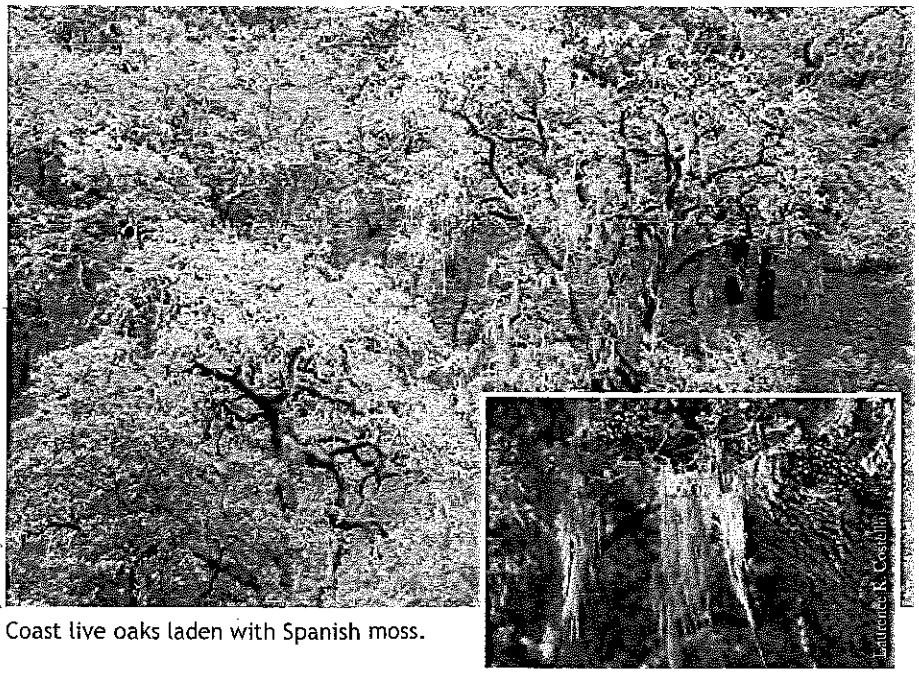
Doug McCreary

Heart rot is common in mature oaks.

Another fungal malady, called heart rot, occurs when one of several wood decay fungi degrades the heartwood of an oak. Although this does not usually impair the tree's vigor, it does weaken it structurally. Weakened branches can break off and a weakened trunk may not be able to support the crown, especially during a windstorm. Heart rot commonly develops in large pruning wounds. Regular examination of the tree and judicious pruning and bracing can prolong the life of an oak with heart rot.

Mistletoes

These parasitic plants grow in the branches of many oaks and can cause structural weaknesses that make the tree more vulnerable to branch breakage. Small infestations may affect the appearance of a tree but generally have little impact on tree health or vigor. Even large infestations, which



Jack Kelly Clark.

Coast live oaks laden with Spanish moss.

can weaken trees, rarely kill them. Mistletoes can be controlled in a variety of ways, including removing the infected branches or using registered herbicides. It should be noted that mistletoes are native and beneficial for a variety of bird species that eat the berries and even for deer, which will eat mistletoe foliage that has fallen to the ground.

Spanish moss

The Spanish moss that grows in California is actually not a true moss but a lichen. (The Spanish moss that grows in the southern states is neither a moss nor a lichen, but a bromeliad.) It is not parasitic so is not a serious threat to oaks. Tree growth may be slightly reduced due to shading of leaves in a tree heavily laden with Spanish moss, but the situation is not life threatening and can be reduced by pruning infested branches. Many people consider Spanish moss an attractive adornment to their oak trees.

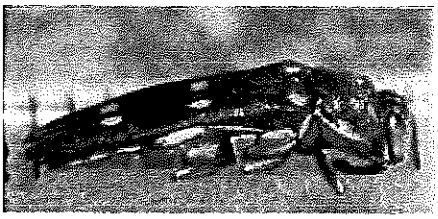
Insect pests

Innumerable insects live on the leaves, branches, trunk, and roots of oak trees, usually without much adverse impact—especially if the tree is vigorous and healthy. Most oak galls, for example, are harmless swellings in response to enzymes released when small gall wasps lay their eggs and the larvae begin to feed. Some of these galls look like dangling Christmas ornaments, while others form exotic multicolored shapes on oak leaves that can resemble sea urchins, sponges, or Chinese hats.

Jack Kelly Clark, courtesy of UC Statewide IPM Program.

Colorful galls caused by gall wasps are common on twigs, branches, and leaves.

Some insect pests do cause injury, however. For instance, pit scales (appearing as pinhead-size scales on the bark of twigs and small branches), oak moths, and other leaf-eating insects are relatively common on a number of oak species and can have striking effects during severe outbreaks. However, even when trees are completely defoliated, they usually recover the following year with little long-term damage, although growth during defoliation is minimal because of greatly reduced photosynthesis. Some insecticides are registered to treat oak insects, but often by the time the symptoms become evident, it is too late for treatment. Oaks and the associated native insects have evolved together and rarely are trees seriously damaged or killed by them. A serious new insect pest, however, believed to have recently arrived from Arizona or Mexico, is the golden spotted oak borer *(Agrilus coxalis),* which is actively spreading and killing coast live oaks in San Diego County.



Tom W. Coleman, courtesy of USDA Forest Service

The golden spotted oak borer is killing oaks in San Diego County.

Mammal pests

In most cases, mammals pose little threat to mature oaks. Browsing or grazing animals may inhibit natural regeneration by chewing on small seedlings, but rarely do they seriously damage mature trees. There have been cases, however, where populations of ground squirrels or other

Pavel Svihra

Sudden Oak Death continues to kill oaks in 14 coastal counties.

ground-dwelling rodents have caused damage to oak roots or girdled young stems. Take measures to control these populations if oak vigor is diminished or if there is extensive excavation by animals in the root zone. The aboveground part of seedlings or saplings can be protected by fencing, wire cages, or treeshelters (see below). The roots of seedlings planted in such areas can be protected belowground by covering the root ball at the time of planting with a wire cage.

Sudden Oak Death

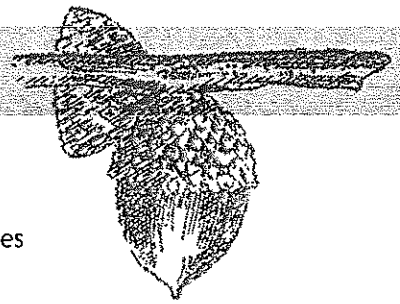
Sudden Oak Death (SOD) is a relatively new disease that affects several native California oak species. It is caused by *Phytophthora ramorum*, a funguslike water mold that causes bark cankers which can girdle and kill mature trees. To date, four of California's 21 species of native oaks are susceptible to this disease: coast live oak, California black oak, Shreve's oak *(Q. parvula var. shrevei)*, and canyon live oak. Currently it does not appear that members of the white oak subgenus, including blue and valley oaks, are susceptible. As of 2009, SOD had been confirmed in 14 coastal counties, extending from Monterey to Humboldt, with locally devastating effects. Fortunately, it appears that conditions further inland (e.g., the Central Valley and the Sierra Nevada foothills) are too hot and dry to permit its spread there. There is an extensive research, monitoring, and education program—coordinated by the California Oak Mortality Task Force—to curtail the spread of this disease and minimize its impact.

MANAGING AND ENHANCING OAK RESOURCES

Livestock grazing has been the dominant land use throughout a majority of the oak woodlands since European settlement, and this use has contributed to the open, pastoral character of much of California's countryside. But it is also in portions of this region that the regeneration for several oak species has been poor, especially during the last 100 years. Cattle are the oft-named culprits since they consume acorns and seedlings and browse saplings and mature trees. They can also compact rangeland soils and remove organic matter. Compaction makes it harder for young roots to grow downward, and removing organic matter can diminish soil fertility.

However, there are situations where oak regeneration remains poor even when livestock are absent. Obviously the oak regeneration problem is more complex, and factors other than livestock are also involved. These may include the replacement of native perennial bunchgrasses by introduced Mediterranean annuals; greater hare, deer, gopher, and ground squirrel populations; insect and soil fauna changes; and alterations in the populations of acorn- and seedling-eating animals. Whatever the causes, it appears that management intervention is now needed—of both land and oaks—if oak trees are to continue their traditional and ecological role as a keystone species on the hardwood range.

Oak Health Check



Check for tree growth

- Tree size is not a good indicator of health. Oaks growing on steep, dry sites may be smaller than others nearby but may still be very healthy.
- Twig growth for the season can vary greatly. If twig growth is less each year, however, the tree may be declining.
- Look for bark growth cracks on a tree's trunk. Cracks appear as widening fissures on existing bark. Tissue in the cracks should be bright green or pink when scratched. Loose bark indicates dead tissue.

Check for pests and stress

- Watch for disease or insect infestations indicated by leaf loss, changes in leaf color, twig dieback, sooty foliage, wet sticky foliage, or other significant changes in appearance.
- Watch for twig and branch dieback. This can be an indication of disease, root loss, or other root-zone problems.
- Watch for emergence of clumps of honey-colored mushrooms at or near the base of a tree in the fall and early winter. These are often accompanied by a white, fan-shaped fungal growth between the bark and sapwood. These symptoms accompany oak root fungus, *Armillaria mellea*.
- Early leaf loss may signal declining vigor—but not always. Deciduous oaks have been noted as being drought deciduous. This occurs during dry years when soil moisture is depleted early and oaks shed their leaves early to help conserve moisture. Deciduous oaks normally do not lose their leaves until late November—but under very dry conditions, they can shed leaves in midsummer. Early leaf loss appears to cause little long-term damage.

Check for structural weakness

- Oaks growing in a natural setting usually do not require pruning. However if dead or dying branches pose a safety hazard or threaten buildings, have them pruned or cabled by a qualified arborist.
- Watch for developing structural weaknesses caused by wood decay, mistletoe, heavy foliage, or poor branch structure. Co-dominant stems, branch attachments with included bark, long horizontal limbs, extensive decay in branches, and cracks developing in crotches are all indications of weak structure. Consult a qualified arborist to determine if pruning will improve structural stability.
- Avoid damage to structural roots.

Check for poor drainage

- Standing water should not be present within a tree's root zone.
- Building, landscaping, or other activities near oaks should not alter drainage patterns in a way that increases water in the root zone.
- Avoid compaction in the root zone.

Check the root crown condition by digging carefully at the base of the tree

- A characteristic root flare at the base of the tree should be obvious. If not, the trunk has been buried and the soil should be excavated to the original grade.
- Large decay pockets at the root crown may indicate a dangerous condition, and a qualified arborist should evaluate the tree for structural integrity.

In managing land, animals, plants, and other resources, there are many things landowners can do to encourage healthy, vigorous oak populations. Some basic management considerations are discussed in the following section. But, in making management decisions that affect your oaks, your greatest guidance may come from your own observations and experiences. Oaks, and the ecological settings where they grow, vary tremendously from place to place, meaning that no one type of management is appropriate for all situations. So, before making decisions, study what is actually taking place on your land and experiment with what you do. You may discover techniques that could also be useful to other landowners.

Oaks and Grazing Animals

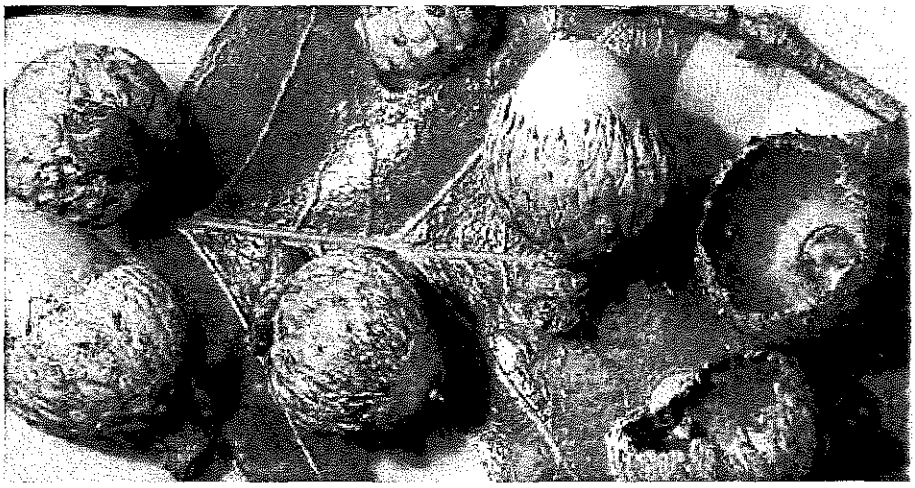
Grazing and browsing animals are ubiquitous components of oak woodlands, but they can damage mature trees as well as seedlings. Watch your trees for signs of damage and take care that the number of animals congregating under them does not cause excessive soil compaction, expose the root crown at the base of the trunk, or expose surface roots. Also watch for excessive chewing on tree trunks. Horses and goats can kill trees by chewing off the bark around the entire circumference of the tree, thereby girdling it. These types of problems are more likely in pastures where animals are concentrated. Measures such as reducing numbers of animals, alternating pastures in use, and installing exclosures, screens, treeshelters, or other protective devices to keep animals away from sensitive trees or seedlings can help alleviate problems. If damage is severe, you may want to consult a qualified arborist for remedial treatments.

Pasture management

In managing your pastures, always remember the general recommendation against summer watering of oaks. If your pastures are irrigated in the summer, adjust irrigation systems to apply water outside of the root zone only. Adjusting watering schedules to infrequent but long periods of irrigation will also reduce stress on oaks. Always try to keep the base of the tree dry. Observe the location of watering devices and other water sources to make sure that the area beneath an oak's canopy does not become wet from leaky water lines, valves, holding tanks, or from animals splashing in troughs.

Promoting Oak Regeneration

As noted previously, there is evidence that several species of native oaks in California—particularly blue oak, valley oak, and Engelmann oak—are not regenerating well in certain areas of the state. In addition to poor natural regeneration, the total acreage of these species has been depleted from residential and commercial development, range improvement, agricultural conversions, and firewood harvesting. To ensure that these species remain important components of the natural landscape of California, it may be necessary to encourage natural regeneration or to actively restore oaks by planting acorns or seedlings. During the last 20 years, much has been learned about what works and what does not. Based on research and field trials, we now feel we can successfully regenerate native oaks, although it is often necessary to carefully plant and maintain them. Below are general guidelines for encouraging natural regeneration; collecting, storing, and planting acorns; growing seedlings in containers; and outplanting acorns and seedlings in the field. Additional information is available in *Regenerating Rangeland Oaks in California,* UC ANR Publication 21601 (see "References").



UC Cooperative Extension

Acorn production among California oaks is highly variable from tree to tree and from year to year.

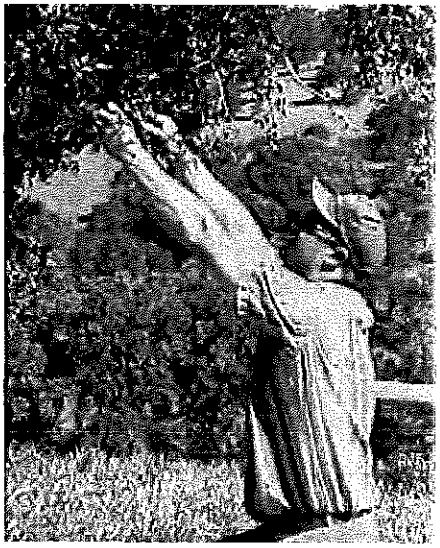
Encouraging natural oak regeneration

Areas particularly favorable to natural regeneration include north-facing slopes, regions with average annual precipitation greater than 20 inches (50 cm), deep or alluvial soils, swales, or other places with subsurface water. Because seedling mortality is usually high, regeneration possibilities are best in areas that can remain free from grazing animals for several years and where existing mature trees provide acorns. Sites offering some natural protection, such as rocky or shrubby areas, or steep slopes that naturally exclude or impede the movements of deer and livestock, may also be favorable. In some areas small seedlings are abundant but larger saplings are rare or nonexistent. This often occurs because both domestic and wild animals repeatedly browse small seedlings, killing them or keeping them stunted. To enhance growth, seedlings can be protected from damaging animals by creating fenced areas, called exclosures, that protect seedlings from animals. Treeshelters (see description below) can be used to protect single seedlings, or larger exclosures can protect entire groves. In pastures grazed by cattle, research has shown that the season of grazing can influence damage levels. Damage is usually greatest in the summer and early fall when few other green plants are available. Grazing only during the green season, when other forage is abundant, can lessen damage and encourage greater seedling growth. Strategically placing water and feed supplements away from potential oak regeneration areas can also reduce damaging impacts to oaks.

Acorn collection, storage, and planting

Acorns are the seeds of oak trees. They begin to develop on the tree in spring, following pollination and fertilization, at about the same time the new leaves are starting to form. Oaks are wind pollinated, so environmental conditions at the time of flowering can affect the size of the acorn crop. Warm, dry, and windy conditions allow the pollen from male flowers, or catkins, to find receptive female flowers, resulting in larger acorn crops. Acorns ripen in the fall, usually in October and November. The acorns of some oak species ripen in a single year, while it takes 2 years for other species. When they mature in the fall, they begin to change color from green to yellow to brown, and the attachment to the acorn cup, or cap, loosens to eventually allow them to fall to the ground. However, one can pick acorns directly from tree branches before they fall to the ground and are consumed by birds, squirrels, or deer, or dry out and decline in quality. Acorns are ripe when they can easily be dislodged from the cup by gentle twisting. When the acorns are ripe, they can also be collected by hitting tree branches with long poles to dislodge them, then collecting them from the ground.

Once collected, all of the acorn cups should be removed before placing the acorns in a container of water. This float test helps separate healthy acorns from damaged or immature ones. Floaters are much less likely to be viable and should be discarded. Sinkers are surface dried and then put in plastic bags and placed in a refrigerator or cold storage unit maintained between 32° and 40°F (0° and 4.4°C). Acorns rapidly lose viability if they dry out, so it is important to place them in plastic bags in cold storage soon after they are collected. They can be stored for several months, but members of the white oak subgenera, including both blue and valley oak, will germinate in cold storage and begin to grow a radicle, or new root. Acorns do not store well, and it is therefore important to plant them as soon as the soil becomes sufficiently moist after the first rains in the fall. They should be placed on their sides and planted between 0.5 and 1.0 inch (10 and 25 mm) deep. The chances of vigorous initial growth can be improved by excavating a hole several inches wide and up to 1.5 feet (50 cm) deep prior to sowing (and filling the hole back up with soil), which allows the initial root to more easily grow downward. Direct planting of acorns eliminates the root disturbance that occurs with transplanting seedlings and allows more natural root development.



Doug McCreary

Acorns can be collected from the branches of oak trees.

Growing oak seedlings in containers

An alternative to directly sowing acorns is to grow oak seedlings in containers and then plant them in the field. These seedlings often have higher survivorship than directly planted acorns, but they also cost far more. It appears that overplanting with acorns is often more cost effective per surviving seedling than planting container stock. When planting on a small scale, however, it may make little difference.

There are a variety of container types and sizes that can be used, but because oaks rapidly grow a deep taproot, it is preferable to use tall, narrow containers instead of short, wide ones. It is also important to prevent seedlings from growing so much that their roots fully occupy the available soil space in the container, causing the seedlings to become pot-bound. Before this occurs they should either be transplanted to a larger pot or planted in the field. Generally, oak seedlings should not be grown in containers of one gallon (3.8 liter) or less for more than a year. It is also critical to plant seedlings in the field early in the season—generally by the end of January—so that they can begin to grow roots before the soil starts to dry out.

Seedling planting and protection

Most oak woodlands in California have an understory of dense, non-native annual vegetation. These plants compete with oak seedlings for moisture and nutrients and can severely limit their growth and survival. It is therefore important that these plants be controlled. Eliminating weeds near planted oaks by scalping (i.e., hoeing), spraying herbicides, or mulching can make the difference between survival and death for young oak seedlings. It can also enhance growth rates. Research suggests that maintaining a weed-free circle, with a 2-foot (60 cm) or larger radius, around seedlings for the first couple of years after planting increases soil moisture and promotes better survival and growth (McCreary 2001). Augering holes prior to planting can also improve seedling field performance on certain sites by allowing seedling roots to more easily penetrate downward where they can obtain soil moisture unavailable at shallower rooting depths. Fertilizing seedlings with slow-release fertilizer tablets at the time of planting has also resulted in significant increases in both diameter and height growth on certain sites.

Jack Kelly Clark

In a study at the Sierra Foothill Research and Extension Center, treeshelters were shown to help oaks become established.

However, even if healthy seedlings are planted correctly at the right time of year and competing vegetation is removed, there still may be significant obstacles to overcome since a variety of animals seem intent on eating them. Oaks are vulnerable to herbivory from a range of animals, from small insects and slugs, to hares and rodents, to deer and cattle. One device that has proven particularly effective in protecting seedlings from a wide range of animals is a treeshelter. This is a double-walled, plastic tube that is placed over individual seedlings. It not only excludes a variety of animals, but it also stimulates seedling growth by acting as a mini-greenhouse.

If acorns or seedlings are planted after heavy rains when soils are moist, watering is not needed. Otherwise, it is a good idea to water planting sites thoroughly at the time of planting. Periodic watering during the first 2 or 3 years usually improves survival and growth, but it may not be logistically feasible for remote planting

sites. In these instances it is even more essential to eliminate competing vegetation. Although it is always helpful to remove competing weeds, supplemental irrigation may or may not be necessary. Average annual rainfall can also influence whether or not to irrigate. In areas that receive less than 15 inches (38 cm) of rainfall, watering the first couple of years, may be essential, while in areas that receive more than 20 inches (51 cm) of average rainfall, watering is often not necessary.

Maintaining genetic integrity

Regardless of whether you are planting acorns you collected yourself or seedlings grown by yourself or others (e.g., native plant nurseries, youth groups, or service clubs), it is important to use local seeds for all wildland plantings. Local ecotypes, or strains of species, have evolved in response to local conditions and are therefore best adapted for survival. Planting off-site material (i.e., acorns collected far from the planting site) is risky since unforeseen events (a rare freeze, for instance) can threaten their survival, even years after the initial planting.

Summary

Oak regeneration studies to date suggest that the survival and growth of native California oaks in a natural setting are often limited by harsh environmental conditions (McCreary 2001). However, by providing a more favorable environment through weed control, augering, watering, and protective tubes, rapid juvenile growth can be stimulated. This allows seedlings to quickly grow above the level where they are particularly vulnerable to browsing pressures and thus helps ensure the success of regeneration plantings.

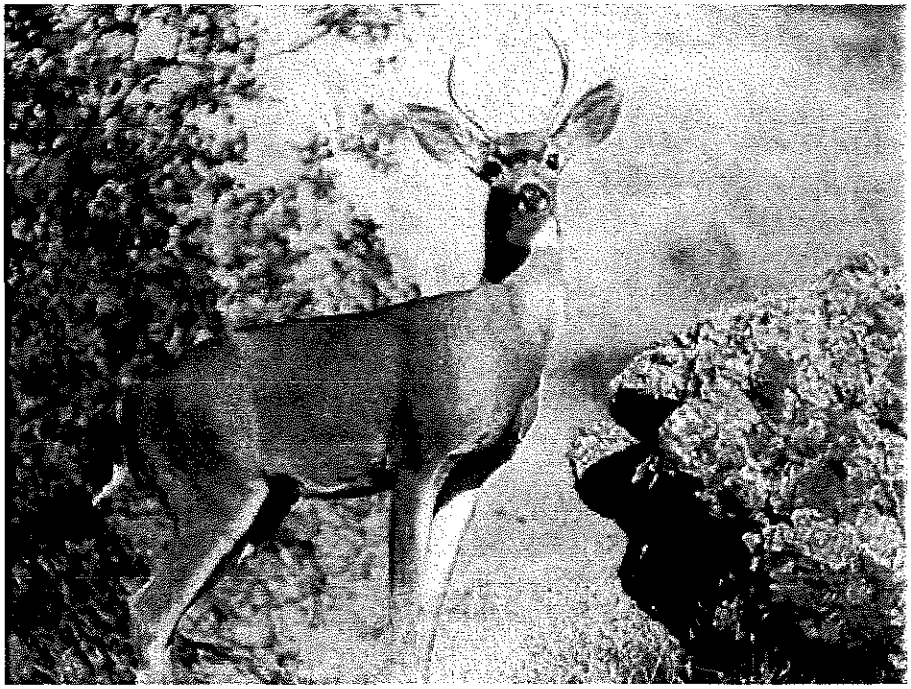
Wildlife Enhancement

Oak environments are among the richest wildlife habitats in the state; 110 species of birds use oak habitats during the breeding season, and 35 percent of California's land mammals utilize oaks during some time of their lives. California's deer herds are particularly dependent on oak habitats. By maintaining the health of your oak woodlands, you promote wildlife health and increase the abundance and diversity of both terrestrial and aquatic species.

Although a few animals can adversely affect oak seedlings, wildlife generally does not harm mature oaks and often provides important benefits through maintaining ecological balances. For instance, blue jays are important acorn planters because they cache large numbers of acorns in the soil but do not retrieve all of them. Some of these germinate and develop into seedlings. The presence of wildlife also adds beauty to a woodland and value to property. Landowners can take some measures to increase the abundance and diversity of wildlife on their lands. Here are a few suggestions:

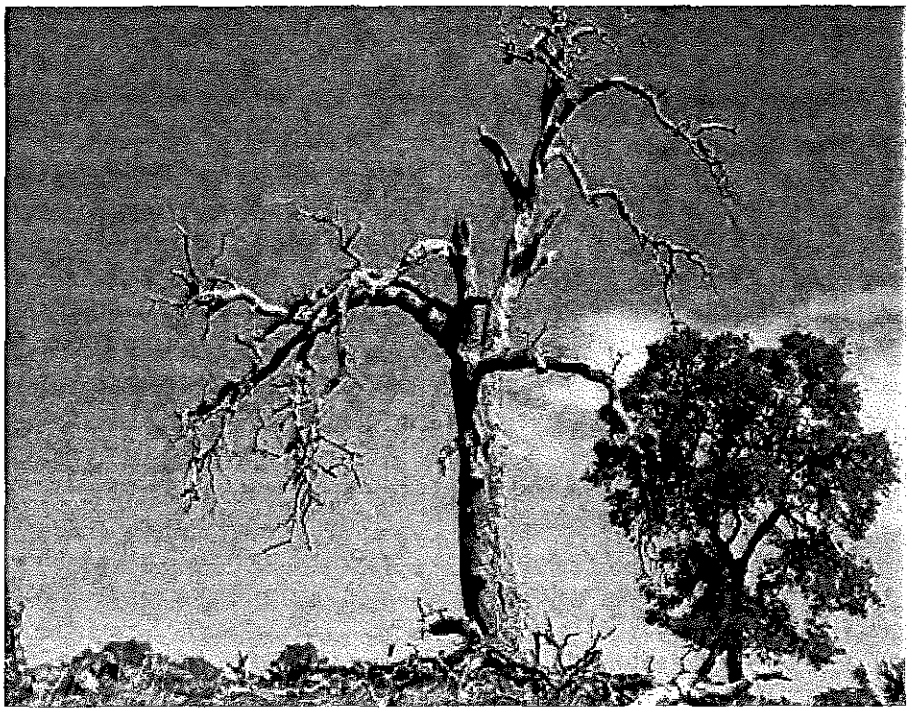
Leave brush piles in areas where they do not pose a fire hazard. These environments are used by quail for cover and by small animals for food and shelter, and they can provide nurseries for the natural regeneration of trees and shrubs.

Large, old trees, especially deciduous species, are particularly valuable for wildlife. They have abundant foliage for foraging birds and insectivorous bats, deeply furrowed



Bob Keiffer

Mule deer are common residents of California's oak woodlands.



Doug McCreary

Although oaks are long lived, all trees eventually die. Adequate regeneration is necessary for a species to survive and prosper.

bark that provides wildlife cover and insect prey, abundant acorns, and nesting cavities in large limbs and trunks, both living and dead. Fallen leaves and other material from the canopy provide nutrients under these trees that support a host of soil invertebrates. At the landscape scale, a large, lone tree provides connectivity between wooded patches, adds structural diversity, and may provide a safe stopping point for migrating birds. Large trees have been referred to as a keystone species; that is, their ecological benefits are disproportionate to their numbers. Large dead trees in woodlands, called snags, are generally rare, but they provide important cavity and perch sites. They should therefore be retained, unless they pose a fire hazard or safety concern.

Coarse, woody debris (fallen limbs and trees) is valuable for invertebrate and vertebrate wildlife alike. Among terrestrial vertebrates (birds, mammals, amphibians, reptiles), large logs are especially valuable for reptiles and amphibians. However, recent research has shown that large wood is in short supply in over half of California's oak woodlands, apparently due to landowner efforts to reduce fire risk and to keep the woodlands looking clean and well maintained. It is therefore beneficial to retain large, woody debris whenever possible, as long as it will not interfere with other management practices, including fire-hazard reduction.

Shrub cover—that intermediate layer between tree canopy and ground cover—influences the existence of many small animals. It may supply all of life's requisites for some of these species, such as shrub-obligate birds. Examples of native shrubs that provide cover, as well as food, for wildlife include coffeeberry *(Rhamnus californica),* toyon *(Heteromeles arbutifolia),* and manzanita (*Arctostaphylos* spp.). Shrubs can increase the number of wildlife species inhabiting an area and may also function as refugia for wildlife during extended periods of drought.

Manage vegetation for diversity. The diversity of wildlife depends upon the diversity of habitats and age classes of vegetation. If you maintain a diverse structure at the landscape scale (grassland, woodland, shrubland), as well as a diverse structure at the local scale (tree, shrub, and ground covers), you encourage a greater diversity of wildlife. Mixed stands of oaks (i.e., both evergreen and deciduous species) are also advantageous since they provide a greater variety of habitat elements.

Wetlands. Probably no component of oak woodland habitat is more important for wildlife than riparian and other wetland areas. Because of the multiple layers of vegetation in wetlands (ground, shrub, and tree), wetlands support numerous species of wildlife, including many threatened and endangered species. However, wetland areas are particularly sensitive to management practices, such as intensive grazing, and so they should be monitored carefully. Oaks along streams help stabilize the banks, and

by shading the stream, they help keep the water cool for native trout and other fish. If dead oaks or branches fall into streams, consider leaving them if they do not present a flooding hazard. Woody debris in streams helps to create pools and provides structure and cover for native fish, including trout, and for amphibians and invertebrates.

Thinning. Individual oaks and groves of oaks can be thinned to meet specific landowner needs. Thinning can increase residual tree growth, stimulate young trees, produce firewood, encourage wildlife, increase forage for livestock, and improve fire safety. The degree of thinning and the selection of trees depend on the nature of the woodland and the objectives of the landowner, but it is important to avoid thinning too heavily. Generally, it is a good idea to leave at least 30 to 40 percent canopy cover following thinning.

Commercial endeavors. Because of ever-increasing demands of a growing human population on dwindling open space resources, owners of rural and semirural woodland areas can use their lands for a variety of commercial ventures that ideally are compatible with native oaks. Some potential crops are Christmas trees, specialty nursery plants, or mushrooms. You can also open your lands for fee-based recreational uses such as camping, hiking, hunting, horseback riding, bird watching, photography, fishing, or mushroom picking. Increasing income to owners of large woodland parcels may help them retain their properties as wildlands rather than selling them to developers.

COMMUNITY ACTIVITIES

Throughout California, landowners are coming together to solve common problems in their oak woodlands. Many regional problems can only be solved by landowners working together in innovative ways. Here are a few examples of landowner efforts:

Landowner associations. In many areas, particularly newer subdivisions, landowner associations are working on a variety of issues, including fire safety, regional landscaping, and woodland protection. One excellent example initiated over 20 years ago is the Portola Valley Ranch, a Hardesty Associates project. This planned unit development in the foothills of the Santa Cruz Mountains includes areas of shared oak-woodland open space that are managed and maintained by the Ranch Homeowners Association.

Open space easements and dedications of land. In many areas individual landowners, entire developments, and local land trusts are dedicating lands to open space uses through conservation easements and a variety of other legal tools. Landowners dedicating such lands often receive tax relief and, in some instances, cash payments. Conservation easements restrict future development but allow normal management activities, including grazing, farming, and even tree harvesting. The Nature Conservancy, the Trust for Public Land, and the California Rangeland Trust are just a few of the organizations that operate such programs, along with many small community land trusts.

Community and watershed groups. These have developed throughout California to sponsor a variety of education, protection, and woodland enhancement activities. These groups pursue public awareness and educational programs, tree planting projects, registry programs for significant individual trees, and lobbying efforts with local jurisdictions to protect a variety of natural resources, including trees. Two excellent examples are the Sacramento Tree Foundation and the Putah Creek Council, both of which have been in operation for more than 20 years.

Carbon Sequestration

There is a wealth of scientific data indicating that carbon dioxide concentrations in the atmosphere have increased dramatically in the last century. Many believe this will result in climate change and, more specifically, global warming. California has become a leader in committing to reduce greenhouse gas emissions that contribute to elevated atmospheric CO_2 concentrations. One new approach has been to promote a cap-and-trade system whereby those generating emissions can purchase carbon offsets equal to the amount of carbon they emit. Since oak woodlands store considerable carbon in tree biomass, including roots, property owners may soon be able to sell carbon credits to emitters. While this approach is new and it is hard to predict how effective it will be in reducing emissions, California and its California Air Resources Board (CARB) are at the forefront of implementing this new approach.

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Online Resources

California Oak Mortality Task Force Web site, http://nature.berkeley.edu/comtf/.

California Oak Foundation Web site, www.californiaoaks.org/.

California Native Plant Society Web site, www.cnps.org/.

UC Oak Woodland Web site, http://ucanr.org/sites/oak_range/.

Wildlife Conservation Board Web site, www.wcb.ca.gov/.

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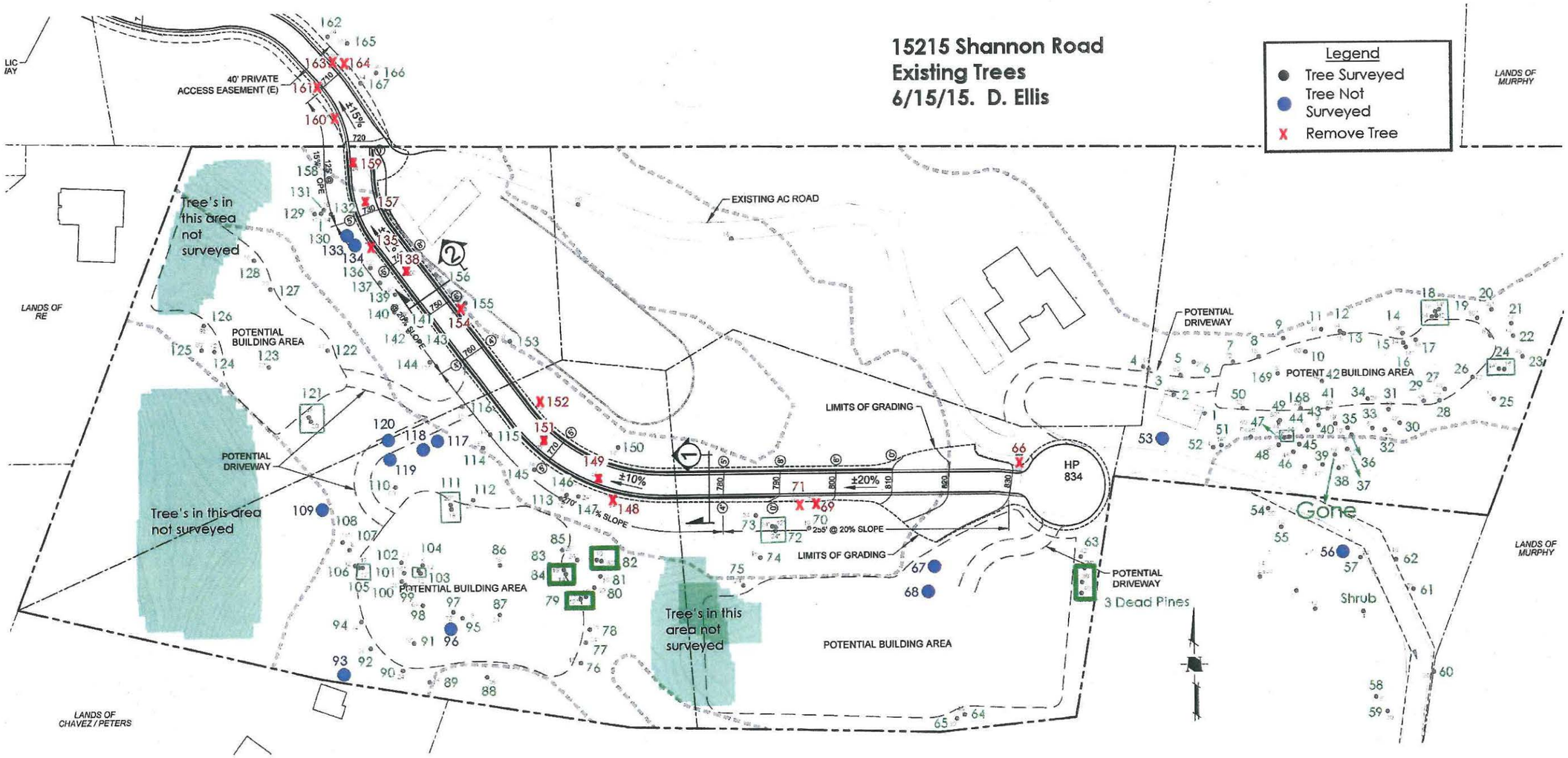
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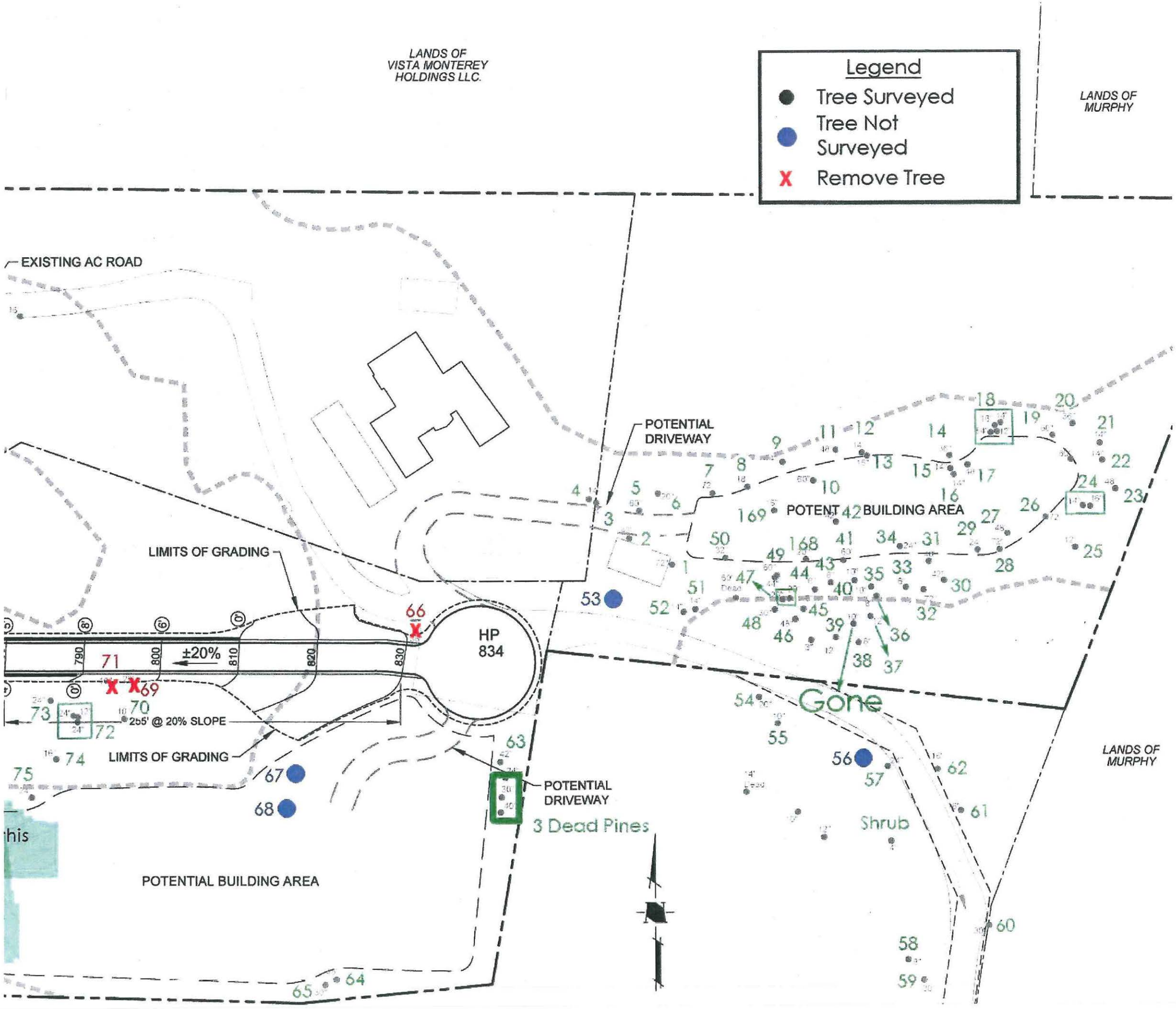
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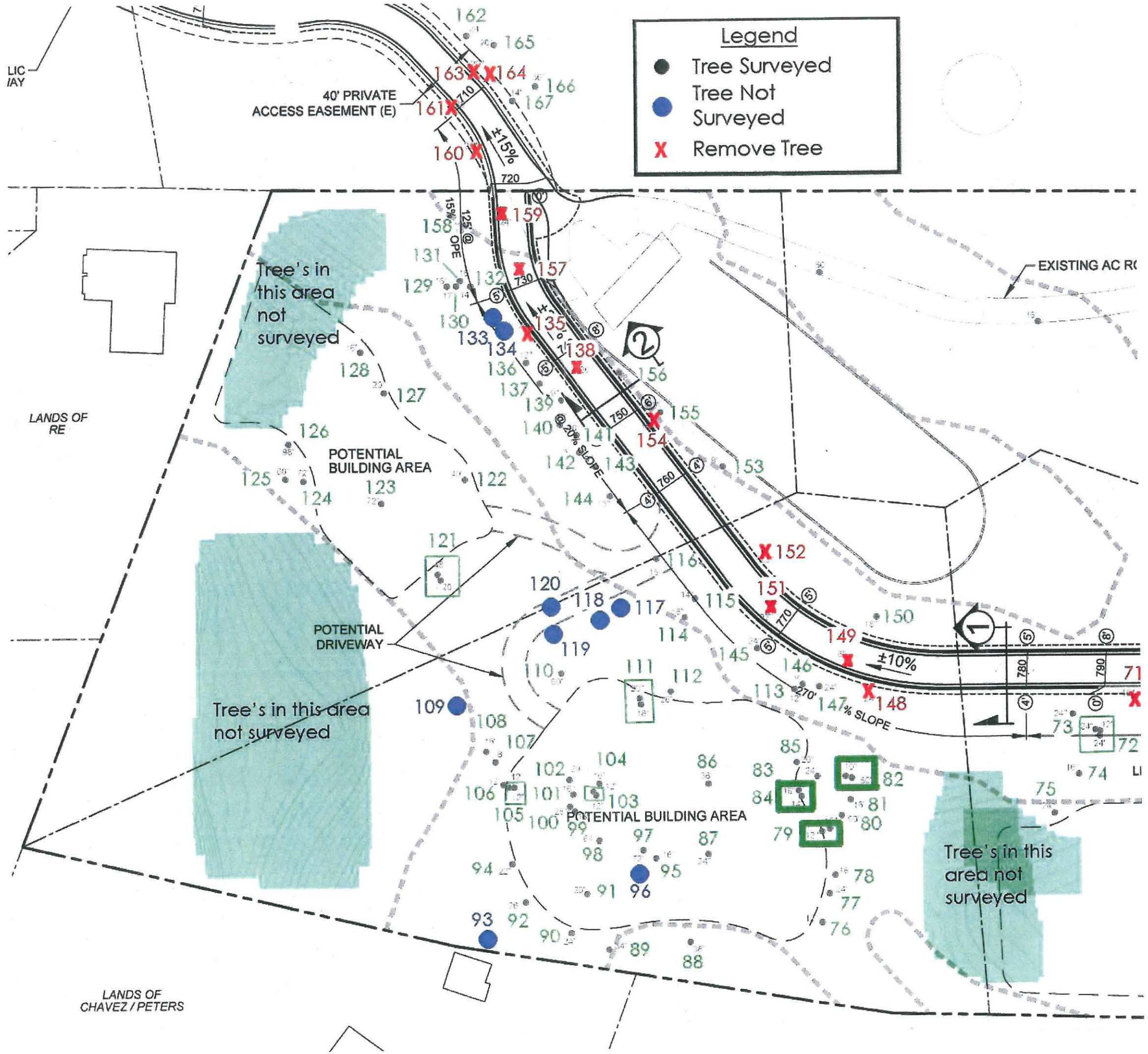
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Attachment C
Geotechnical Report

UPP GEOTECHNOLOGY
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19 March 2015
Document Id. 15006C-01L1
Serial No. 17085

Mr. Fred Sahadi
15215 Shannon Road
Los Gatos, CA 95032

SUBJECT: GEOLOGIC AND GEOTECHNICAL FEASIBILITY STUDY
PROPOSED FIVE-LOT SUBDIVISION
SAHADI PROPERTY
APN 537-25-002, 15215 SHANNON ROAD
LOS GATOS, CALIFORNIA

Dear Mr. Sahadi:

INTRODUCTION

This document presents the results of our geologic and geotechnical feasibility study for the proposed five-lot residential subdivision of your property, APN 537-25-002 at 15215 Shannon Road in the Los Gatos area of unincorporated Santa Clara County, California (see Figure 1, Site Location Map). We understand that as part of the subdivision project, the property will be annexed into the Town of Los Gatos jurisdiction.

We understand that you are planning to subdivide the approximately 13-acre parcel into 5 roughly 2½-acre residential properties (designated Lots 1 through 5). An existing residence on Lot 2 will remain and the other four lots will be developed at a later date. We also understand that the future homes will be serviced by the municipal sewer system.

The properties will be accessed by an extension of Santella Drive (being constructed as part of the Highlands of Los Gatos project), a private street extension across an adjacent property, and a new private shared access road, cul-de-sac, and individual driveways on your property. The shared access road construction, along with individual driveways to the four proposed building sites, will likely require retaining walls at various locations on both the uphill and downhill sides of roadway and driveways.

We anticipate that additional geotechnical studies will be performed, at a later date, for the road construction and development of each lot. The purpose of this study was to evaluate the geologic and geotechnical feasibility of the proposed subdivision.

SCOPE OF SERVICES

As the basis for this study, we have reviewed geologic maps, hazard maps, and aerial photographs of the site and vicinity. In addition, we consulted via email correspondence with the Town's reviewing geologist, Mr. Bob Wright, about his concerns with the site and vicinity. We also reviewed a preliminary site plan for the project by HMH, dated 19 November 2014.

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On 2 February 2015, our principal geologist and principal engineer conducted an engineering geologic and geotechnical reconnaissance, and performed geologic mapping of the site. We developed a site plan and engineering geologic map based upon the preliminary site plan by HMH, supplemented by our tape and compass geologic mapping techniques (see Figure 2, Site Plan and Engineering Geologic Map). Following the field mapping, we generated several geologic cross-sections for internal analyses based on the topographic data on the preliminary site plan and our field mapping, and performed geologic analyses. A more detailed study, which would normally include subsurface exploration; laboratory testing; and quantitative geotechnical engineering analyses of the collected data, was beyond the scope of this study.

During this study, we reviewed and compiled data in the vicinity of the subject property in order to provide our opinions relating to the geologic hazards and geotechnical conditions that could affect the proposed improvements. This evaluation is based upon our observations of the surface site conditions, a review of geologic and geologic hazard maps and stereo-paired aerial photographs of the site vicinity, and our general familiarity with the area. A more detailed study could result in substantial modifications of these preliminary conclusions. In addition, another consultant with a different background in training and experience could form different opinions about the site. This study has been conducted in accordance with generally accepted engineering geology and geotechnical engineering principles and practices, and we make no other warranty, either expressed or implied.

We have prepared this report as a product of our service for the exclusive use of Mr. Fred Sahadi for the geologic and geotechnical feasibility of the proposed five-lot residential subdivision, in accordance with our confirming agreement dated 28 January 2015 (Document Id. 15006C-01P1). Other parties may not use this report for other purposes without prior written authorization from C2Earth, Inc.

REGIONAL GEOLOGY

The subject site is within the California Coast Ranges geomorphic province, characterized by northwest-southeast trending valleys and ridges. The subject property is sited along the crest of Blossom Hill Ridge, an isolated hill north of the northeastern base of the central Santa Cruz Mountains.

According to the Geologic Map of the Los Gatos Quadrangle (McLaughlin et al., 2001), the subject site is underlain by middle and lower Miocene age (approximately 11½ to 23 million years old) Monterey shale bedrock at depth see (Figure 3, Regional Geologic Map). The Monterey Shale consists predominantly of siliceous mudstone, diatomite, and porcellanite.

The bedrock outcrops along eroded creek channels and is at or near the ground surface along prominent ridgelines. The bedrock is overlain by colluvium within the subject property and across most of the hillside areas in the site vicinity. The colluvium cover is estimated to be very thin (up to a few feet thick) in the areas of the proposed building sites, transitioning to moderately thick (estimated to be up to about 8 to 10 feet thick) on the slopes below the building sites. Where the colluvium is located on moderate to steep slopes, it is subject to downhill creep, a process by which the soil moves downslope at an imperceptibly slow rate as a result of gravity.

The originally flat-lying sedimentary bedrock has been uplifted, tilted, and folded by the mountain-building processes that formed the Santa Cruz Mountains. The property straddles a northwest-trending syncline flanked by spur ridges on either side (see Figure 3). A review of the geologic map shows the bedding attitudes in the site vicinity are consistent with folding associated with a synclinal feature. Within the northeast portion of the property, bedrock bedding strikes (is oriented) approximately northeast and dips (slopes downward) 50 degrees to the southeast. Just beyond the southwest property corner, the bedding strikes northwest and dips 26 degrees to the northeast (see Figure 3). Within the southeastern corner of Lot 5, we measured a north-northeast bedrock strike and a dip of 76 degrees to the east.

SEISMICITY

Geologists and seismologists recognize the greater San Francisco Bay Area as one of the most active seismic regions in the United States. The seismicity in the region is related to activity within the San Andreas fault system, a major rift in the earth's crust that extends for at least 700 miles along the California Coast. Faults within this system are characterized predominantly by right-lateral, strike-slip movement. The four major faults that pass through the Bay Area in a northwest direction have produced approximately 12 earthquakes per century strong enough to cause structural damage. These major faults are the San Andreas, Hayward, Calaveras, and San Gregorio faults.

The site can be expected to experience periodic minor earthquakes or even a major earthquake (Moment magnitude 6.7 or greater) on one of the nearby active or potentially active faults during the design life of the proposed project. The Moment magnitude scale is directly related to the amount of energy released during an earthquake and provides a physically meaningful measure of the size of an earthquake event.

The U.S. Geological Survey (2008) estimates that by 2038 the probability of a Moment magnitude 6.7 or greater earthquake occurring on one of the active faults in the San Francisco region is 63%. The following table provides corresponding estimates for the probability of a major earthquake for the different faults in the Bay Area.

Fault	Probability (%)
Hayward – Rodgers Creek	31
San Andreas	21
Calaveras	7
San Gregorio	6
Concord-Green Valley	3
Greenville	3
Mount Diablo Thrust	1

30-Year Probability of Magnitude 6.7 or Greater Earthquake

The San Andreas fault has a regional trend of approximately N34W; however, the segment of the San Andreas fault located within the central Santa Cruz Mountains southwest of the site strikes approximately N44W, forming a restraining bend. This restraining bend has created a compressional zone along the east side of the Santa Cruz Mountains, resulting in the formation

of the Frontal thrust fault system, comprised of reverse and right-reverse faults, including the Berrocal-Monte Vista-Shannon faults within the eastern foothills and the alluvial plain adjacent to the foothills (Angell et al. 1997). This thrust fault system bounds the southwest margin of the Santa Clara Valley.

The property is mapped between two traces of the Shannon fault (see Figure 3). The following table indicates the approximate distance and direction from the central portion of the site to active and potentially active faults.

Fault	Approx. Distance From Fault	Direction From Site
Shannon (SW)	1,000 feet	Southwest
Shannon (NE)	1,600 feet	Northeast
San Andreas	4¾ miles	Southwest
Hayward	10¾ miles	Northeast
Calaveras	14 miles	Northeast
San Gregorio	21 miles	Southwest

Regional Fault Distances

The site is mapped outside of fault rupture potential zones designated by the Town of Los Gatos (see Figure 4, Town of Los Gatos Fault Rupture Potential Map). These zones were created based upon the Fault, Lineament, and Coseismic Deformation Mapping by Nolan Associates, 1999 shown on Figure 5. The Fault, Lineament, and Coseismic Deformation Map shows saddle lineaments trending northwest-southeast, along the mapped trace of the Shannon fault located northeast of the site. This map also shows concentrations of coseismic ground deformation associated with the 1989 Loma Prieta earthquake mapped 3,000 feet or more to north, northeast, and northwest of the subject property. According to mapping by Schmidt et. al., 1995, this deformation generally consisted of fresh concrete pavement breaks or buckles suggestive of contractional deformation and concrete pavement breaks with unspecified sense of deformation (see Figure 6, Observed Distress from the 1989 Loma Prieta Earthquake Map).

Because of the site's proximity to the San Andreas and Shannon faults and the site's geology, maximum anticipated ground shaking intensities for the area are characterized as strong and equal to a Modified Mercalli (MM) intensity of VII (Borcherdt, et. al., 1975). A MM intensity of VII generally causes slight damage in well-built ordinary structures, and considerable damage in well-built ordinary buildings (Yanev, 1974) (see Table I, Modified Mercalli Scale of Earthquake Intensities).

The intensity of an earthquake differs from the Moment magnitude, in that intensity is a measure of the effects of an earthquake, rather than a measure of the energy released. These effects can vary considerably based on the earthquake magnitude, distance from the earthquake's epicenter, and site geology.

Since 1800, four major earthquakes have been recorded on the San Andreas fault. In 1836, an earthquake with an estimated maximum intensity of VII on the MM scale occurred east of the Monterey Bay on the San Andreas fault (Topposada and Borchardt, 1998). The estimated Moment magnitude (M_w) for this earthquake is about 6.25. In 1838, an earthquake occurred with

an estimated intensity of about VIII-IX (MM), corresponding to a M_w of about 7.5. The San Francisco Earthquake of 1906 caused the most significant damage in the history of the Bay Area in terms of lives lost and cost of property damage. This earthquake created a surface rupture along the San Andreas fault from Shelter Cove to San Juan Bautista, about 290 miles in length. It had a maximum intensity of XI (MM), a M_w of about 7.9, and was felt as far away as Oregon, Nevada, and Los Angeles. The most recent earthquake to affect the Bay Area was the Loma Prieta earthquake of 17 October 1989, occurring in the Santa Cruz Mountains, which had a M_w of about 6.9. Ground shaking equal to an MM intensity of between VI and VII was felt at the site during the Loma Prieta Earthquake (Stover, et al., 1990).

In 1868 an earthquake with an estimated maximum MM intensity of X and M_w of about 7.0 occurred on the southern segment of the Hayward fault, between San Leandro and Fremont. In 1861, an earthquake of unknown magnitude (likely having an M_w of about 6.5) was reported on the Calaveras fault. The most recent significant earthquake on this fault was the 1984 Morgan Hill Earthquake, that had an M_w of about 6.2.

LANDSLIDING

According to the State of California Seismic Hazard Map for the Los Gatos 7½-Minute Quadrangle, portions of the site are mapped within State Seismic Hazard Zones for earthquake-induced landsliding (see Figure 7, Regional Seismic Hazard Zones Map). In addition, similar portions of the site are mapped within the Town of Los Gatos Landslide Hazard Areas Map, as shown on Figure 8.

During our site reconnaissance and mapping, we identified an older, moderately-sized slump-type landslide on the west facing slope in the southwest portion of the property straddling the property line between proposed Lots 3 and 4. Based on our surficial mapping, the landslide mass measures about 45 feet wide by about 130 feet long. An evacuated headscarp characterized by an over-steepened slope gradient of between about 1½:1 to 2:1 (horizontal to vertical) was also mapped uphill of the landslide. The surficial geomorphology suggests the landslide is a relatively shallow slump-type feature, with an estimated thickness of about 10 feet.

Our review of stereo-paired historical aerial photographs and our site reconnaissance revealed the remainder of slopes on the property are relatively planar and did not reveal indications of landsliding.

SITE DESCRIPTION

The irregular shaped, approximately 13-acre site is situated along the crest of Blossom Hill Ridge (see Figure 1). The topography at the eastern portion of the site consists of an east-west trending spur ridge. The spur ridge branches into two northwest-trending spur ridges at the approximate central portion of the site. Between the two spur ridges is a northwest trending swale that slopes gently to moderately downward toward the northwest. The swale is occupied by an arena that will remain. In addition, an existing residence on Lot 2 that will remain is situated along the crest of the spur ridge northeast of the arena (see Figure 2).

The site is elongated, with its long axis oriented in the east-west direction. The subject property is bound to the southeast by undeveloped private properties, to the north by the Highlands of Los Gatos development and a municipal water tank site, and by developed private properties on the remaining sides.

Currently, the property is accessed by a paved driveway leading through an easement from Shannon Road to a cul-de-sac in front of the existing residence in the eastern central portion of the property. The limits of the proposed five subdivided parcels are shown on Figure 2; descriptions of the topographic and geologic conditions of each of the proposed subdivided lots are provided in the following subsections.

Lot 1

Lot 1 is located at the northeast portion of the parcel and straddles an east-west trending spur ridge. The spur ridge flanks slope moderately steep to steeply downward toward the north and south with slope gradients of between about 2:1 and 2½:1, with some localized ares on the north-facing slope as steep as about 1½:1. The proposed building area sits atop the very gently sloping ridge with gradients of approximately 5:1 to 10:1, sloping downward toward the west.

A graded trail exists near the top of the north-facing slope below the crest of the ridge. The trail appears to have been constructed by placing fill along the downhill, northern side of the trail. Vegetation within this lot consists of bare slopes and grasses on the slope south of the the ridge, scattered mature trees along the ridge top, and dense brush and vegetation on the north-facing slope north of the ridge.

Lot 2

Lot 2 is situated adjacent to the western side of Lot 1, in the northern central portion of the parcel. An existing single family residence, swimming pool, and single story auxiliary structure are locate within the eastern portion of Lot 2, atop a northwest trending spur ridge. We understand that the residence and associated structures will remain as part of the development. A small wedge of fill appears to have been placed near the southwest corner of the home, with an unsupported fill slope along the downslope side of the pad (see Figure 2). Additional fill appears to have been placed northeast of the home, which is retained by a poured concrete retaining wall. The wall and residence appear to be in good condition.

The spur ridge flanks slope moderately steep to steeply downward toward the northeast and southwest-west with slope gradients of between about 2:1 to 3:1. The southwest-west facing slopes forms the top of a topographic bowl above a northwest trending saddle that corresponds with a mapped geologic syncline in the bedrock (see Figure 3).

A graded horse arena occupies the bottom of the swale, in the southwest corner of Lot 2, the eastern edge of Lot 3, and a small areas of Lots 4 and 5 (see Figure 2). We understand this arena will remain as part of the development.

An existing alternate access road leads uphill the northwest corner of the lot to the existing residence. The road appears to have been constructed using cut-fill techniques. Additional small level pads for auxiliary sheds and structures are located at various locations upslope and downslope of the existing alternate access road (see Figure 2).

Lot 3

Lot 3 is in the northwest portion of the parcel, and straddles a northwest trending spur ridge. The spur ridge flanks slope moderately steep to steeply downward toward the northeast and southwest with slope gradients of between about 2:1 to 3:1. The proposed building area sits atop the very gently sloping ridge crest, which has a downslope plunge of about 7:1, sloping toward the northwest.

The northeast facing slope below the ridge was observed to be mantled by a layer of colluvial soil that may be several feet thick. In the southern portion of the lot, the ground surface descends from the spur ridge towards the southwest. As discussed previously in the section titled "Landsliding", a moderately sized slump-type landslide was mapped on the slope. The landslide mass and scarp areas are about 76 and 60 feet south of the proposed building area for Lot 3, respectively. Vegetation on the site consists of mature oak and other trees along the ridge crest and northeast facing slope, underlain by grasses and brush.

An existing stable structure sits at the northwest end of the existing horse arena, in the northeast corner of Lot 3. The existing alternate access route that leads to the residence on Lot 2 (discussed previously) enters the property in the northern central portion of Lot 3. A proposed new shared access road for the development will lead from the existing entrance to the access road, around the west-southwest side of the stable and arena, and traverse the northeast facing slope below the ridge crest. A driveway is planned from the new shared road to the building area, which may require cuts and fills or site retaining walls.

Lot 4

Lot 4 comprises the southwestern corner of the parcel, and straddles a northwest trending spur ridge. Similar to Lot 3, the spur ridge flanks slope steeply to moderately steep downward toward the northeast and west, with slope gradients of between about 2:1 to 3:1. The proposed building area sits atop the generally level ridge.

As discussed above in the section titled "Landsliding" we identified a moderately sized, shallow slump-type landslide on the west-facing slope west of the building envelope. The landslide mass and top of the evacuated headscarp area are about 65 and 28 feet west from the potential building area for Lot 4, respectively (see Figure 2).

Vegetation on the site consists of mature oak and other trees along the ridge crest and northeast facing slope, underlain by grasses and brush. South of the proposed building area, the slope descends to the south to a developed residential parcel.

The proposed shared access road is planned to continue from Lot 3 along the northeast facing slope below the proposed building area, and, similar to Lot 3, a proposed driveway will lead from the shared road to the building site. As with the driveway for Lot 3, we anticipate that grading and/or site retaining walls may be required for the driveway.

Lot 5

Lot 5 is planned for the southeast portion of the parcel, south of Lot 2. The topography is dominated by an isolated knoll in the southeast corner of the proposed lot, and gentle to steep slopes that descend from the knoll down to the northwest and west.

An existing sports court occupies a cut-fill pad in the southeastern corner of the lot. We observed shallow Monterey formation shale bedrock exposed in the cut slope on the south side of the sports court. Concrete Masonry Unit (CMU) block wall, tanks, and storage sheds were observed above the cut-slope on the south side of the sports court.

The existing driveway that leads to the existing residence (on Lot 2) from Shannon Road enters the northeast corner of Lot 5, and terminates in a broad, flat parking area. We observed that some fill had been placed previously along the western edge of the parking area. Vegetation on Lot 5 consists of sparse mature trees, and associated grasses and brush.

The proposed shared access road leading from Lot 3, through Lot 4, is planned to terminate in a cul-de-sac at the location of the existing parking area. Similar to Lots 3 and 4, the shared access road may require cuts and fills or retaining walls to be constructed.

LANDSLIDE SCREENING ANALYSIS

As described previously, portions of the subject site are mapped within the State Seismic Hazard zone for earthquake-induced landsliding (see Figure 7). The purpose of this qualitative screening analysis was to evaluate the severity of the earthquake-induced landsliding hazard on the subject site and to determine if further analysis is warranted (CDMG, 1996). In accordance with Special Publication 117A by the California Geological Survey (2008), our screening analysis includes an evaluation of the following questions:

- ***Are existing landslides, active or inactive, present on, or adjacent (either uphill or downhill) to the project site?*** As described previously, a shallow, slump-type landslide measuring about 130 feet long by 45 feet wide is located on the west-southwest facing slope near the southwest corner of the property. The headscarp for the landslide encroaches to about 28 feet from the potential building area for Lot 4, and is more than 60 feet from the building area for Lot 3. We did not observe evidence for landslides on other slopes on or adjacent to the property.
- ***Are there geologic formations or other earth materials located on or adjacent to the site that are known to be susceptible to landslides?*** Based on our site reconnaissance and review of regional geologic maps, the Monterey shale formation underlying the subject site does not appear to be generally susceptible to landslides in this vicinity.
- ***Do slope areas show surface manifestations of the presence of subsurface water (springs and seeps), or can potential pathways or sources of concentrated water infiltration be identified on or upslope of the site?*** Slope areas on the site (with the exception of the shallow landslide) are uniform and drainage courses are not disturbed. We did not observe any evidence of springs or seeps in areas that could affect the proposed development.

- ***Are susceptible landforms and vulnerable locations present? These include steep slopes, colluvium-filled swales, cliffs or banks being undercut by stream or wave action, areas that have recently slid.*** We did not observe any susceptible landforms on the property or off the property in the immediate vicinity of the proposed building envelopes.
- ***Given the proposed development, could anticipated changes in the surface and subsurface hydrology (due to watering of lawns, on-site sewage disposal, concentrated runoff from impervious surfaces, etc.) increase the potential for future landsliding in some areas?*** In our opinion the current improvements concept will not increase the potential for landsliding on the subject site. The sites will not use on-site sewage disposal systems, they will be serviced by the municipal sewer.

SLOPE STABILITY ANALYSES

Overview

Because we identified a shallow slump-type landslide on the slope below Lots 3 and 4, and because of the proximity of the over-steepened headscarp to the proposed building area for Lot 4, we performed a preliminary quantitative slope stability analysis of the west-facing slope. It should be noted that this preliminary analysis is based upon published data and our observations of site surficial conditions. Further geologic study that may include performing subsurface exploration, may result in different parameters being used in the study, which may yield different analysis results.

The following paragraphs describe the methodology and results of a quantitative slope stability analyses that we performed to evaluate the relative risk of the reactivation of the shallow landslide, or new landsliding within the headscarp area below the proposed building area on Lot 4. We performed the analyses using the computer program Slide 5.0 by Rocscience, Inc., utilizing Bishop's method to calculate the factor of safety against sliding. The analyses were performed in general accordance with the guidelines presented in the Special Publication 117A by the California Geological Survey (2008).

You should note that computer-aided slope stability analyses are mathematical models of the slopes and soil and they contain many assumptions. Slope stability analyses and the generated factors of safety only indicate general slope stability trends. In general, factors of safety below 1.00 indicate a potential failure. However, a slope with a factor of safety of less than 1.00 will not necessarily fail, but the probability of failure will be greater than that for a slope with a higher factor of safety. Conversely, a slope with a factor of safety greater than one may fail but the probability of stability is higher than that for a slope with a lower factor of safety.

Slope Geometry

We performed the slope stability analyses utilizing the surface profile and subsurface interpretation depicted on Figure 9, Geologic Cross-Section A-A'. We generated this profile from the preliminary site plan, our field observations and mapping, and our estimation of the slide depth based on empirical parameters.

Soil Strength Parameters

We obtained soil and rock strength parameters for the landslide deposits and the Monterey Formation bedrock from the published values provided in the Seismic Hazard Zone Report for the Los Gatos 7½-Minute Quadrangle, Santa Clara County, California (California Geologic Survey, 2002). For the published subsurface units, we used the median cohesion along with the recommended phi angle. In addition, we assumed wet and saturated unit weights based upon our experience in the area.

A table of the soil and rock parameters is presented below.

Unit	Phi Angle (degrees)	Cohesion (psf)	Wet Unit Weight (pcf)
Landslide Deposits	12	745	110
Monterey Formation	25	797	115

Soil and Rock Properties

Groundwater Conditions

Because of the shallow nature of the slump-type landslide, and because of the sites topographic setting and underlying free-draining Monterey Shale bedrock, we performed our analyses without the influence of groundwater.

Seismic Coefficient

A static (non-seismic) analysis was initially performed using no seismic coefficient. Based on information included in the Seismic Hazard Zone Report for the Los Gatos 7½-Minute Quadrangle, Special Publication 117A, and the site's probabilistic peak ground acceleration (10 percent exceedance in 50 years) obtained from the Ground Motion Interpolator tool (California Geological Survey, 2008), we derived a seismic coefficient of 0.27 for the site and utilized it in our pseudo-static analyses.

Slope Stability Analysis Results

Slope Stability Analysis No. 1 and 2 evaluated the potential for landsliding within the mapped landslide and the over-steepened headsacarp above the landslide, under static and seismic conditions, respectively. The program searched potential failure planes initiating anywhere on the subject slope and each analysis ran searched thousands of potential failure surfaces.

The lowest factors of safety for each analysis is presented in the following table and graphical illustrations of potential failure surfaces are shown on Figures 10 and 11, Slope Stability Analysis No. 1 and 2).

Analysis No.	Slope	Seismic	Factor of Safety
1	Cross-Section A-A'	Static	2.12
2	Cross-Section A-A'	0.27	1.22

Slope Stability Analyses and Results

FINDINGS

Based upon the results of our study, it is our opinion that, from a engineering geologic and geotechnical engineering perspective, the subject property may be subdivided as planned. In our opinion, there are no significant geologic hazards or geotechnical conditions that would preclude development within the proposed building areas. The primary constraints to the proposed site developments include:

- the site's seismic setting;
- the steep slopes and the potential for earthquake-induced landsliding; and
- the site-specific earthwork and foundation requirements to develop the individual lots.

Fault Hazards

Our reconnaissance and review of published geologic maps and aerial photographs revealed that no known active or potentially active faults pass through the subject property. However, it is reasonable to assume that the site will be subjected to strong ground shaking from a major earthquake on at least one of the nearby active faults during the design-life of future improvements. During such an earthquake, it is our opinion that the danger from fault offset through the site is negligible.

Landslide Hazards

Our study showed no evidence of recent landsliding on the property in the immediate vicinity of the proposed building sites. However, as described above, we identified a shallow, slump-type landslide on the west-southwest facing slope west of the building envelope for Lot 4 and south of the building envelope for Lot 3.

Based on the distance between the landslide mass and over-steepened headscarp to the building envelope on Lot 3, the distance between the landslide mass and the building envelope on Lot 4, and the results of our slope stability analyses, we judge there is a low risk that earth movement associated with this landslide or headscarp could impact the integrity of the building envelopes on these lots.

We conclude that there is a negligible risk that deep-seated landsliding could impact the proposed building areas. Because of the moderate to steep slopes on and around the property, the occurrence of a new shallow landslide within or adjacent to the subject property cannot be excluded. A new shallow landslide (approximately less than 10 feet deep) could be triggered by excessive precipitation or strong ground shaking associated with an earthquake. In our opinion, a landslide of this nature should not constitute an immediate threat to the integrity of structures built within the proposed building envelopes, provided they are designed and supported on modern foundations, in accordance with the recommendations provided in a project-specific geotechnical study.

In our opinion, the risk for damage to structures within the proposed building areas from landsliding is no greater than that of the average hillside residential property in Santa Clara County.

The long-term stability of many hillside areas is difficult to predict. A hillside will remain stable only as long as the existing slope equilibrium is not disturbed by natural processes or by the acts of Man. Landslides can be activated by a number of natural processes, such as the loss of support at the bottom of a slope by stream erosion or the reduction of soil strength by an increase in groundwater level from excessive precipitation. Artificial processes caused by Man may include improper grading activities, the introduction of excess water through excessive irrigation, improperly designed or constructed drainage, and poorly controlled surface runoff.

Although our knowledge of the causes and mechanisms of landslides has greatly increased in recent years, it is not yet possible to predict with certainty exactly when and where all landslides will occur. At some time over the span of thousands of years, most hillsides will experience landslide movement as mountains are reduced to plains. Therefore, a small but unknown level of risk is always present to structures located in hilly terrain. Owners of property located in these areas must be aware of, and willing to accept, this unknown level of risk.

Proposed Residences

Based upon our site reconnaissance, and because the proposed building sites are located along ridge tops, we anticipate very shallow bedrock in the vicinity of the proposed residences. We anticipate that a minimal amount of colluvial soil and/or fill may overlie the bedrock on the ridge crests. However, up to several feet of colluvial soil may mantle the slopes on the ridge flanks. Because the the proposed building sites are generally level to very gently sloping, and are in areas underlain by shallow bedrock, it is our opinion that the proposed building areas are feasible from geologic and geotechnical engineering perspectives.

We anticipate that residences and associated structures within the proposed building envelopes can likely be supported on conventional shallow foundations where colluvium or fill thicknesses are minimal, and by standard drilled pier and grade beam foundations where colluvium and/or fill thicknesses exceed several feet. The proposed development of the newly created lots will be based upon a future, site specific geotechnical study that will provide lot-specific foundation and drainage recommendations. Those studies should include an evaluation of expansive soil, as such an evaluation was beyond the scope of this study. In addition, lot-specific geotechnical studies should evaluate local and global slope stability of each building area, concept, and access way.

In our opinion, the proposed building areas are of no higher geologic or geotechnical risk than the average hillside residential property, and development of the proposed building areas will not require beyond normal amounts of geologic hazard mitigation.

Proposed Access Road and Driveways

In our opinion, the proposed shared access road, cul-de-sac, and individual driveways are feasible from geologic and geotechnical engineering perspectives. It should be noted that many of the driveways and the shared access road are planned to traverse a hillside. Retaining walls are anticipated at various locations on both the uphill and downhill sides of the shared access road. Where the road is cut through existing fill, or colluvial soil, the retaining walls may be supported on conventional spread footings gaining support in the underling bedrock. Where on the downslope sides of the shared road or future driveways, it should be anticipated that the walls will likely require drilled pier foundations.

In addition, we anticipate that existing colluvial soil and fill will be required to be removed and replaced as engineered fill where those materials underlie proposed improvements. We anticipate that the proposed shared access road will be designed and constructed in accordance with recommendations developed in a future geotechnical engineering study for the road. In our opinion, the proposed road, driveways, and associated retaining walls and colluvial soil/fill remediation are similar to what would be required for the average residential hillside development in this area, and no significant geologic or geotechnical mitigation will be required for the roadway driveways.

****

It has been our pleasure to perform this evaluation and assist you with your project. If you have any questions, please call.

Sincerely yours,
Upp Geotechnology
a division of C2Earth, Inc.

REGISTERED PROFESSIONAL ENGINEER
CRAIG N. REID
No. 3060
GEOTECHNICAL
STATE OF CALIFORNIA

Christopher R. Hundemer, Principal
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Certified Hydrogeologist 882

Craig N. Reid, Principal
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Mr. David Wilson (3 via mail and via e-mail to dwilson@hmhca.com)

Inclusions: Figure 1, Site Location Map
Figure 2, Site Plan and Engineering Geologic Map
Figure 3, Regional Geologic Map
Figure 4, Town of Los Gatos Fault Rupture Potential Map
Figure 5, Fault, Lineament, and Coseismic Deformation Map
Figure 6, Observed Distress from the 1989 Loma Prieta Earthquake Map
Figure 7, Regional Seismic Hazard Zones Map
Figure 8, Town of Los Gatos Landslide Hazard Areas Map
Figure 9, Geologic Cross-Section A-A'
Figures 10 and 11, Slope Stability Analyses No. 1 and 2
Table I, Modified Mercalli Scale of Earthquake Intensities

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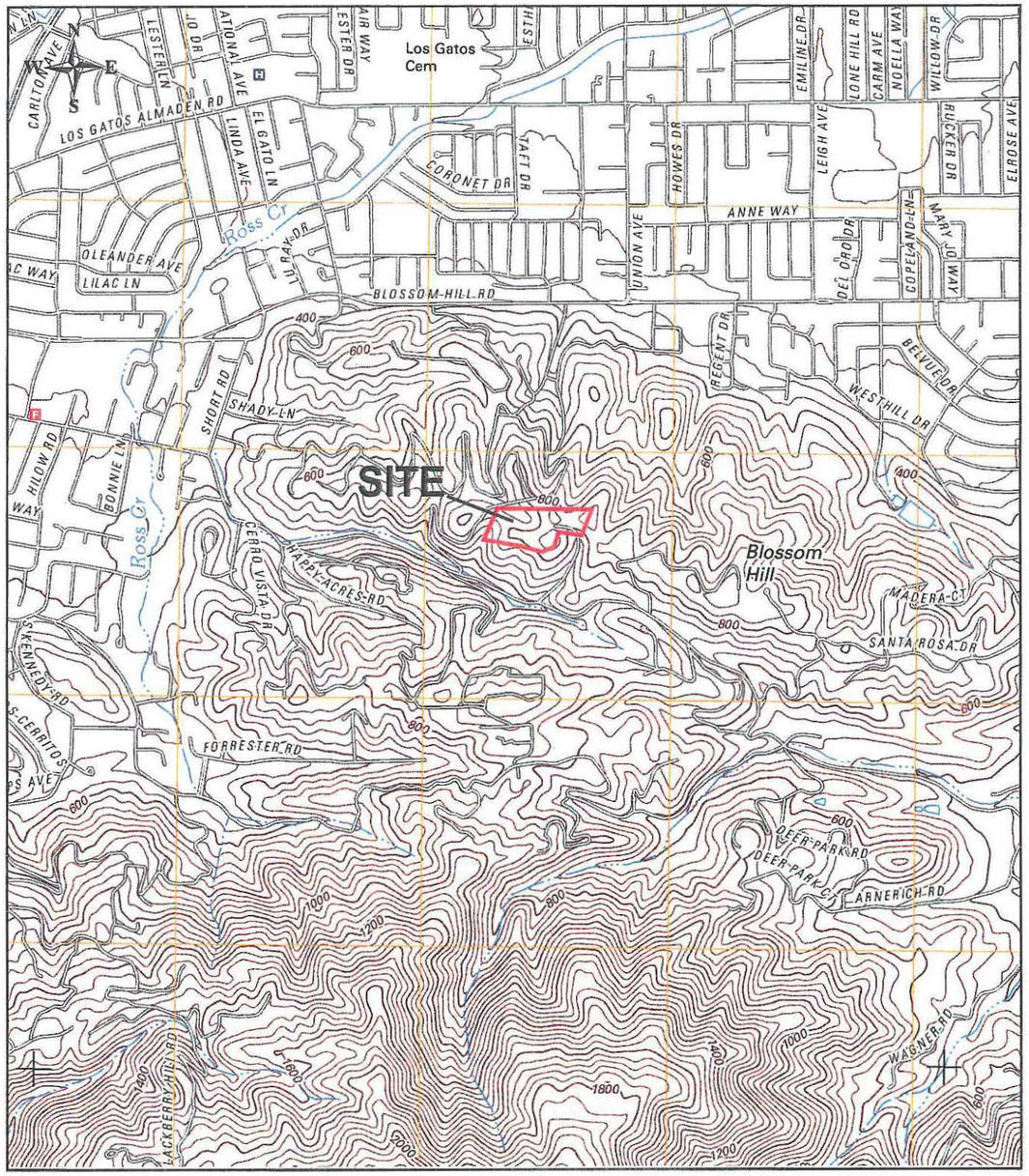

BASE: The National Map US Topo; UNITED STATES GEOLOGICAL SURVEY; 2012

SITE LOCATION MAP

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RH/CH	1" = 2,000'	15006C-01L1	March 2015	Figure 1

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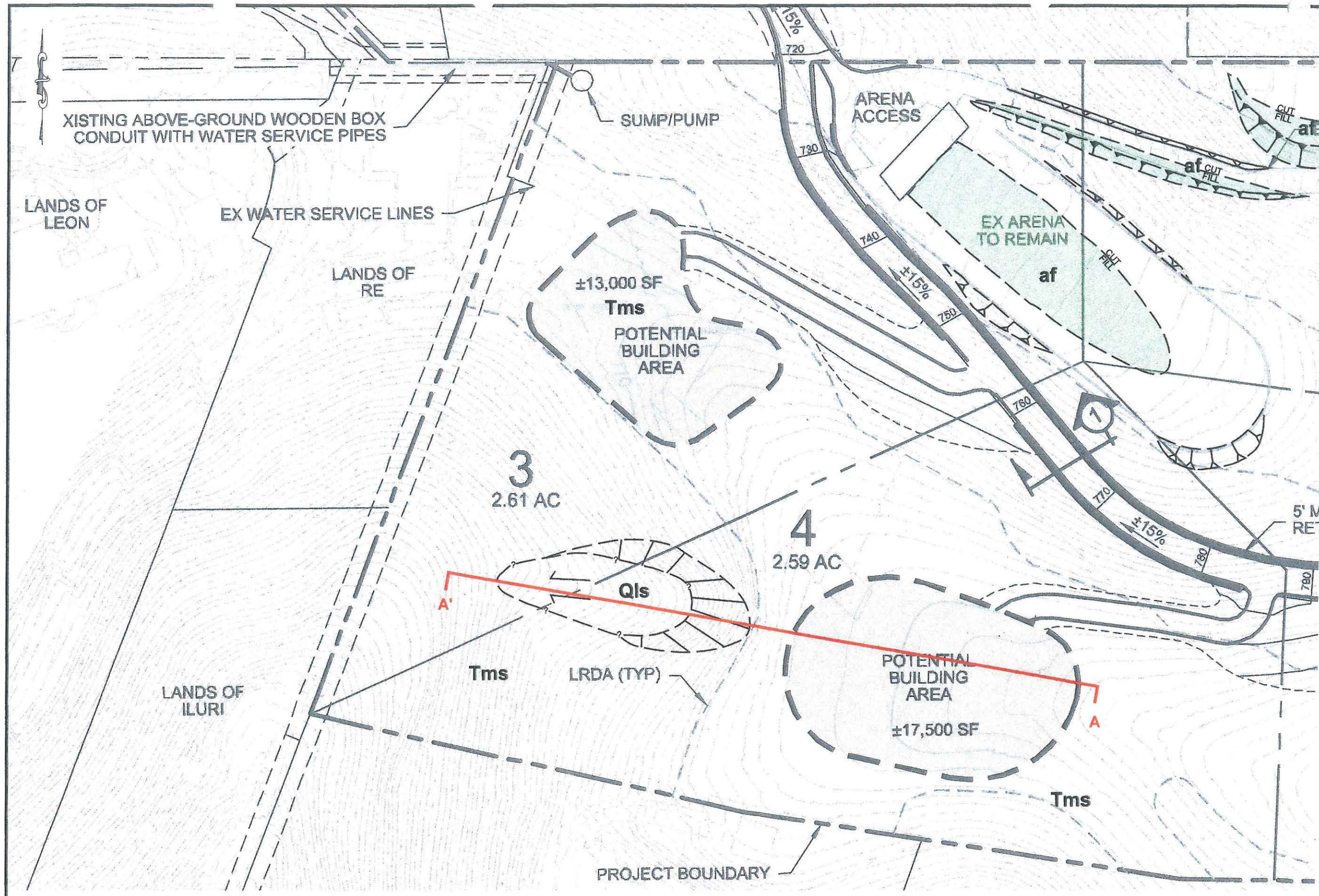

SCALE

60 0 60 120 FEET

NOTE: This plan is a conceptual illustration of observed geotechnical and geologic features and should not be used for an

BASE: Preliminary Site Plan; Sheet 2; HMH; 19 November 2014

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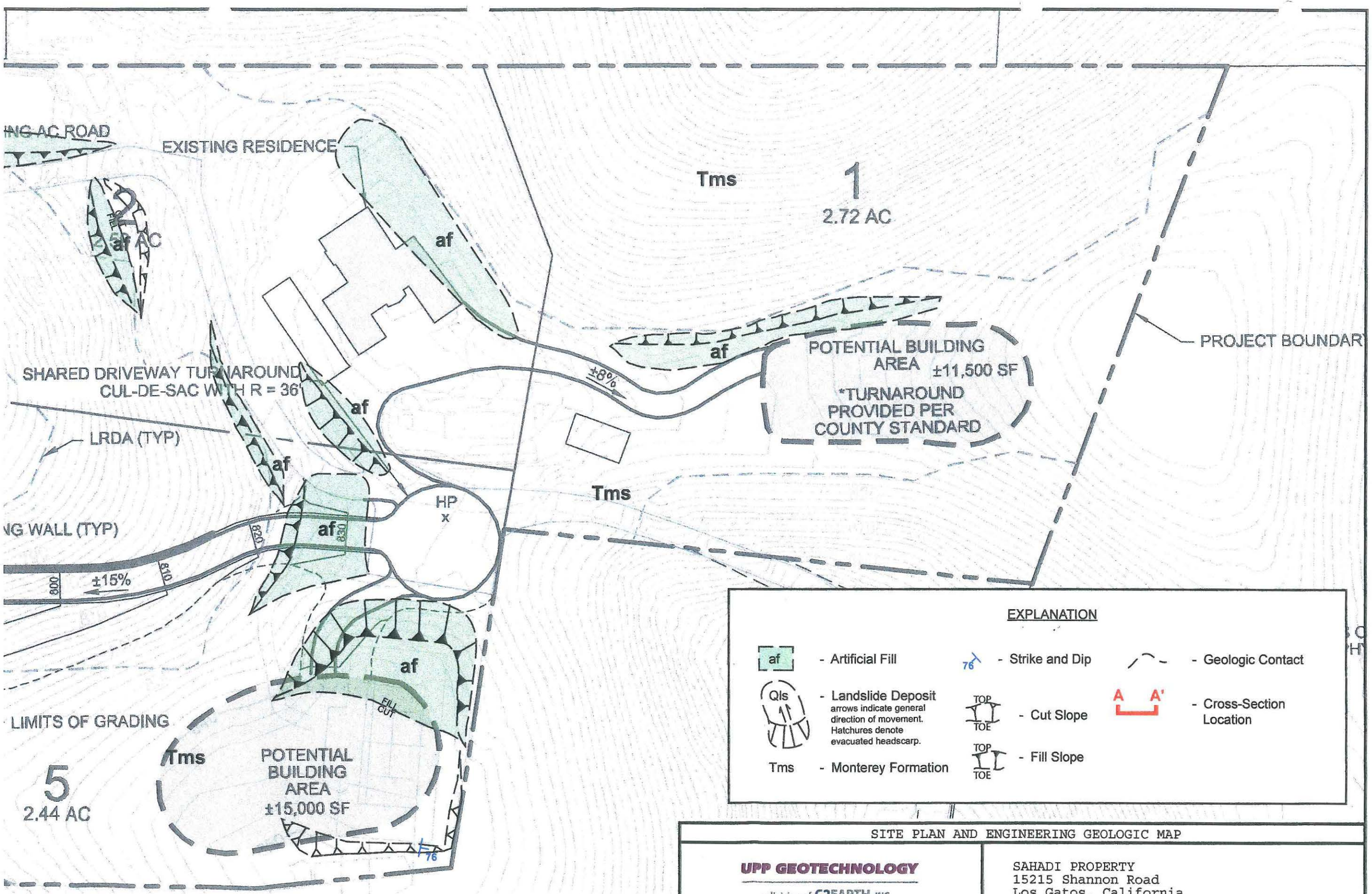

r purpose.

SITE PLAN AND ENGINEERING GEOLOGIC MAP

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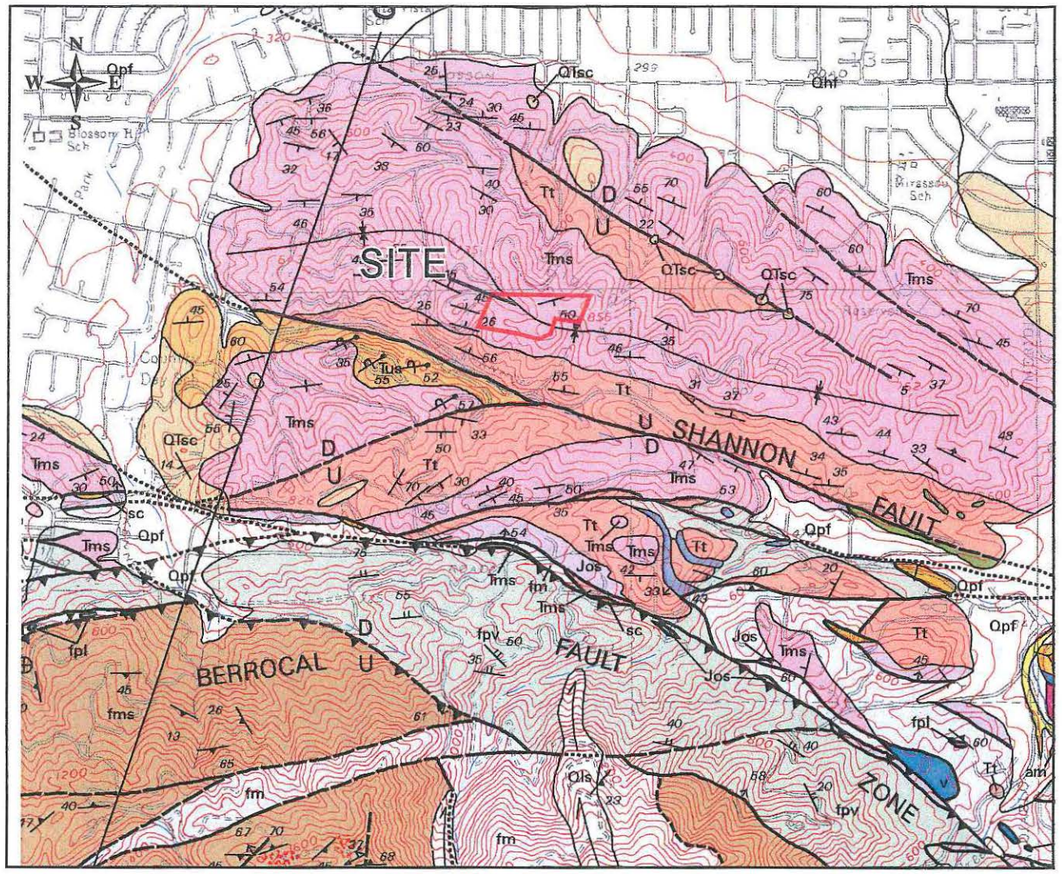

EXPLANATION

Qls	- Landslide deposits, undivided
Qpf	- Alluvial fan deposits
QTsc	- Santa Clara formation
Tus	- Unnamed sandstone
Tms	- Monterey shale
Tt	- Temblor sandstone
Franciscan Complex	
fm	- Melange
fpl	- Foraminiferal limestone
fpv	- Volcanic rocks
fms	- Sandstone

- Strike and dip
- Vertical dip
- Overturned bedding
- Approximate strike and dip
- Inclined shear foliation
- Strike and dip of volcanic flow or of dikes and sills
- Geologic contact — dashed where approximate and dotted where concealed
- Fault — U and D denote upthrown and downthrown blocks, dashed where approximate and dotted where concealed
- Thrust fault — barbs on upper plate
- Syncline — fold axis

BASE: Sheet 1: Los Gatos Quadrangle, Geologic Maps and Structure Sections of the Southwestern Santa Clara Valley and Southern Santa Cruz Mountains, Santa Clara and Santa Cruz Counties, California; MCLAUGHLIN, ET AL.; 2001

REGIONAL GEOLOGIC MAP

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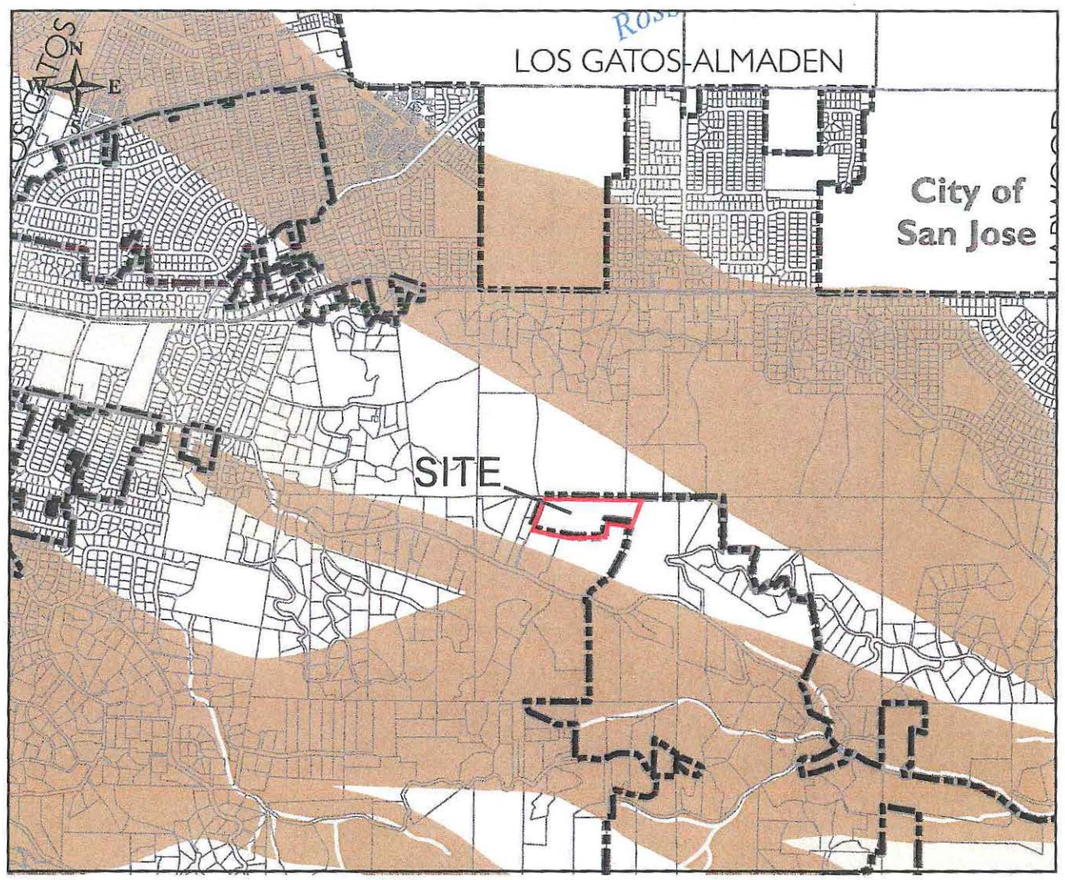

EXPLANATION

- Town Boundary
- Creek

Fault Rupture Potential

- High
- Moderate

BASE: Town of Los Gatos General Plan Update; Fault Rupture Hazard Zones, Figure 16-2; NOLAN ASSOCIATES; 1999

TOWN OF LOS GATOS FAULT RUPTURE POTENTIAL MAP

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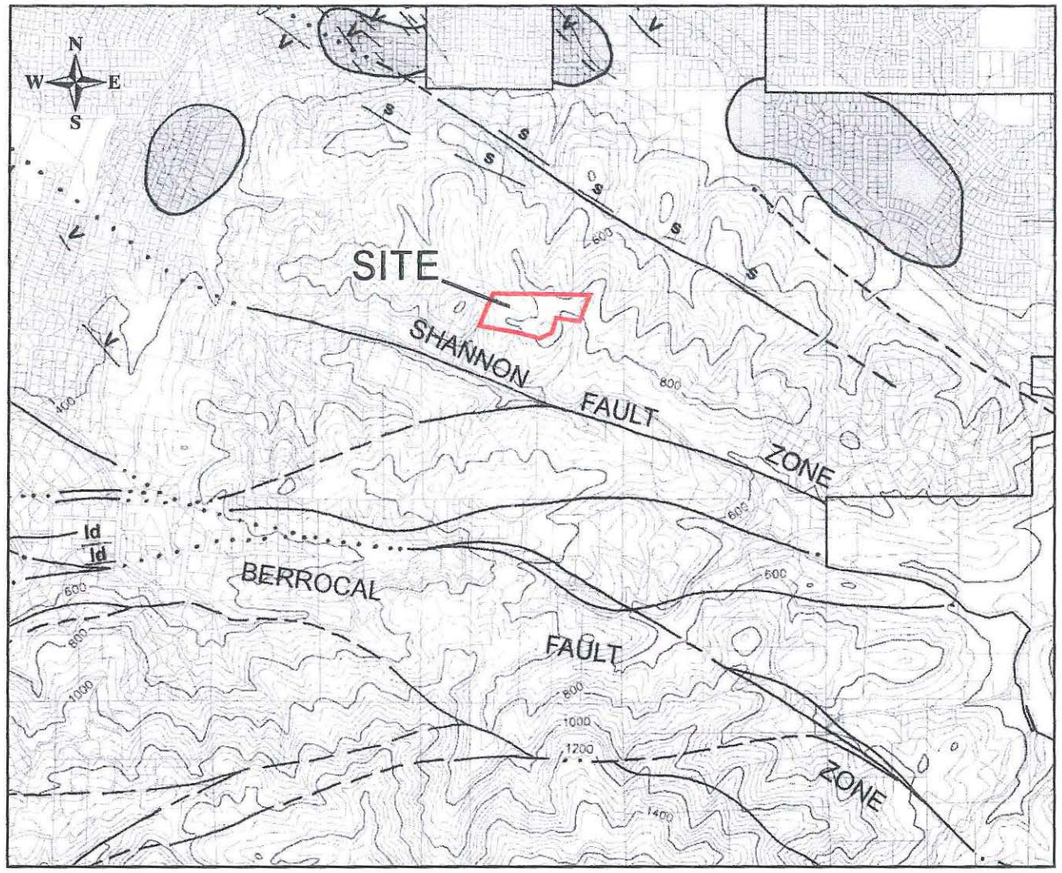

EXPLANATION

- Concentration of coseismic ground deformation

- Fault trace
  dashed where uncertain
  dotted where concealed

s - Lineation indicative of faulting. Interpreted from aerial photograph analysis.
  v = vegetation
  ld = linear depression
  s = saddle

BASE: Town of Los Gatos General Plan Update; Fault, Lineament & Coseismic Deformation Map; Plate #3; NOLAN ASSOCIATES; 1/17/99

FAULT, LINEAMENT, AND COSEISMIC DEFORMATION MAP

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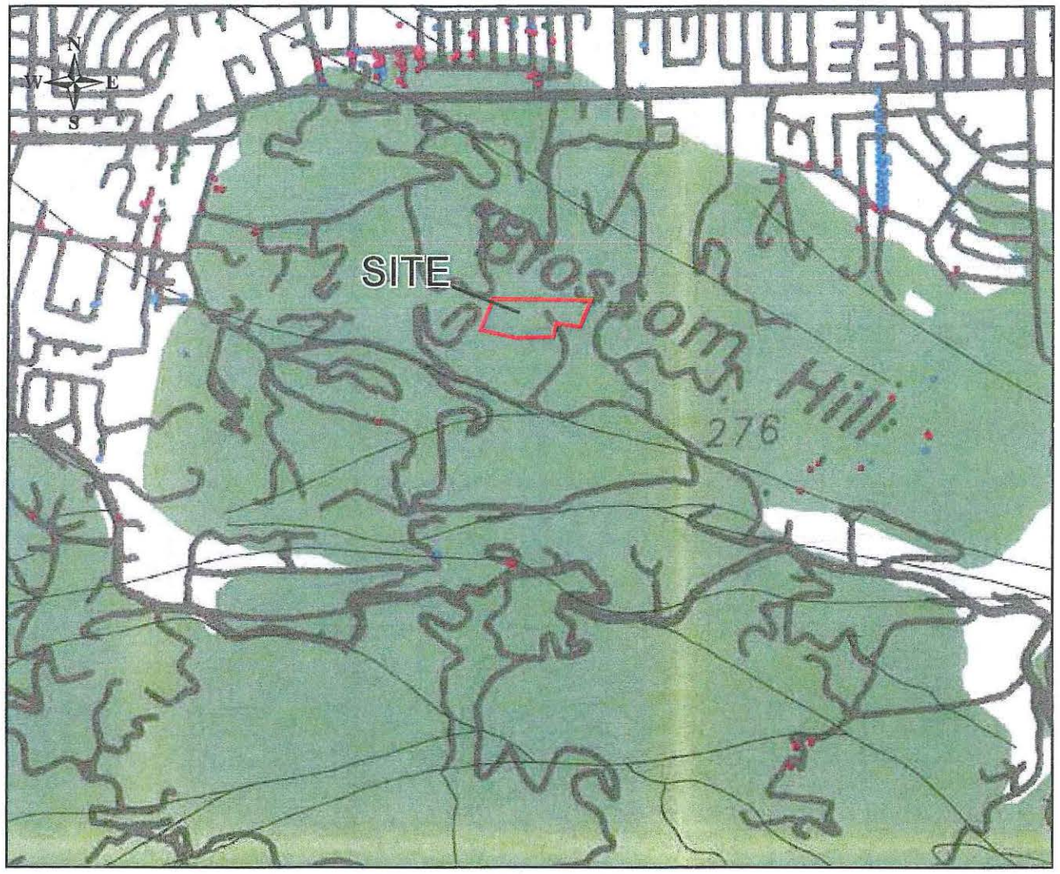

EXPLANATION

Coseismic Concrete Pavement Breaks

- Fresh break or buckle suggestive of contractional deformation (Reported by USGS; some also reported by local governments)
- Apparently fresh break with unspecified sense of deformation (Reported by USGS; some also reported by local governments)
- Break with unspecified sense of deformation (Reported by local governments)

BASE: Map of Pavement and Pipe Breaks As Indicators of Range-Front Faulting Resulting From the 1989 Loma Prieta Earthquake; SCHMIDT ET AL; 1995

OBSERVED DISTRESS FROM THE 1989 LOMA PRIETA EARTHQUAKE MAP

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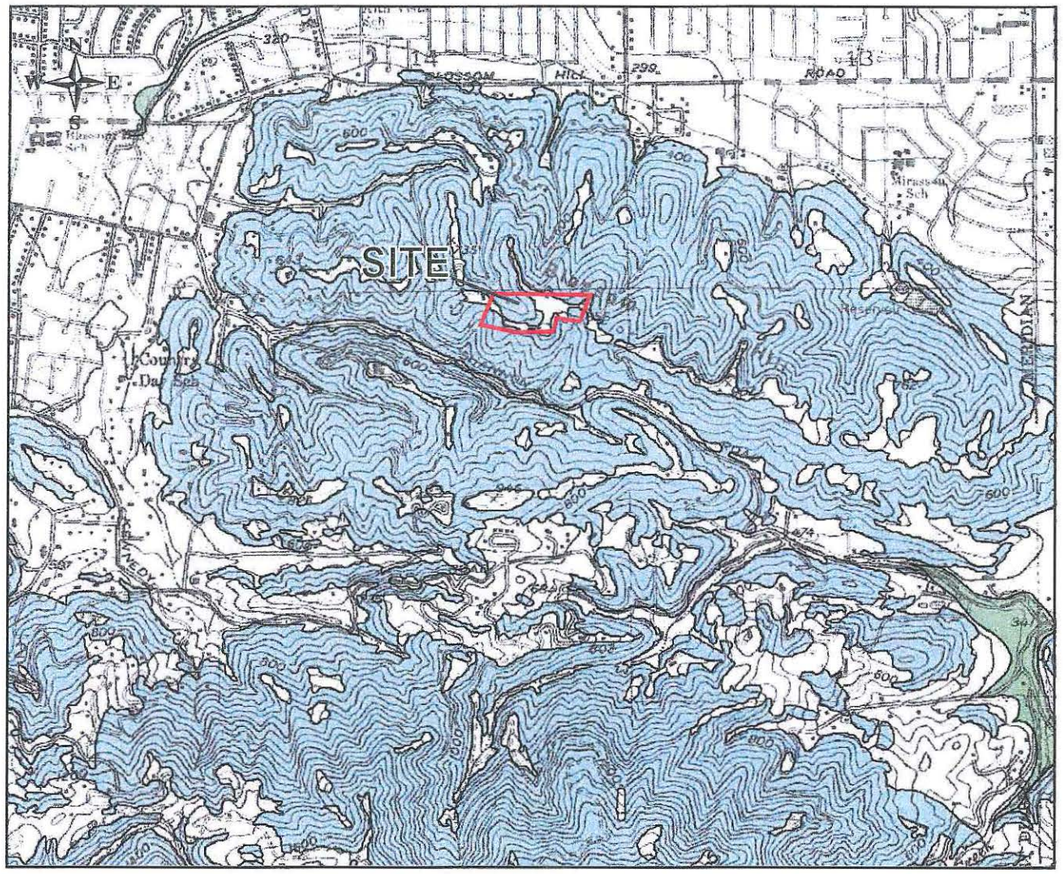

EXPLANATION

- **Earthquake-Induced Landslides;** Areas where previous occurence of landslide movement, or local topographic, geological, geotechnical, and subsurface water conditions indicate a potential for permanent ground displacements.

- **Liquefaction;** Areas where historic occurence of liquefaction, or local topographic, geological, geotechnical, and subsurface water conditions indicate a potential for permanent ground displacements.

BASE: Seismic Hazard Zones, Los Gatos Quadrangle; California Geological Survey; 23 September 2002

REGIONAL SEISMIC HAZARD ZONES MAP

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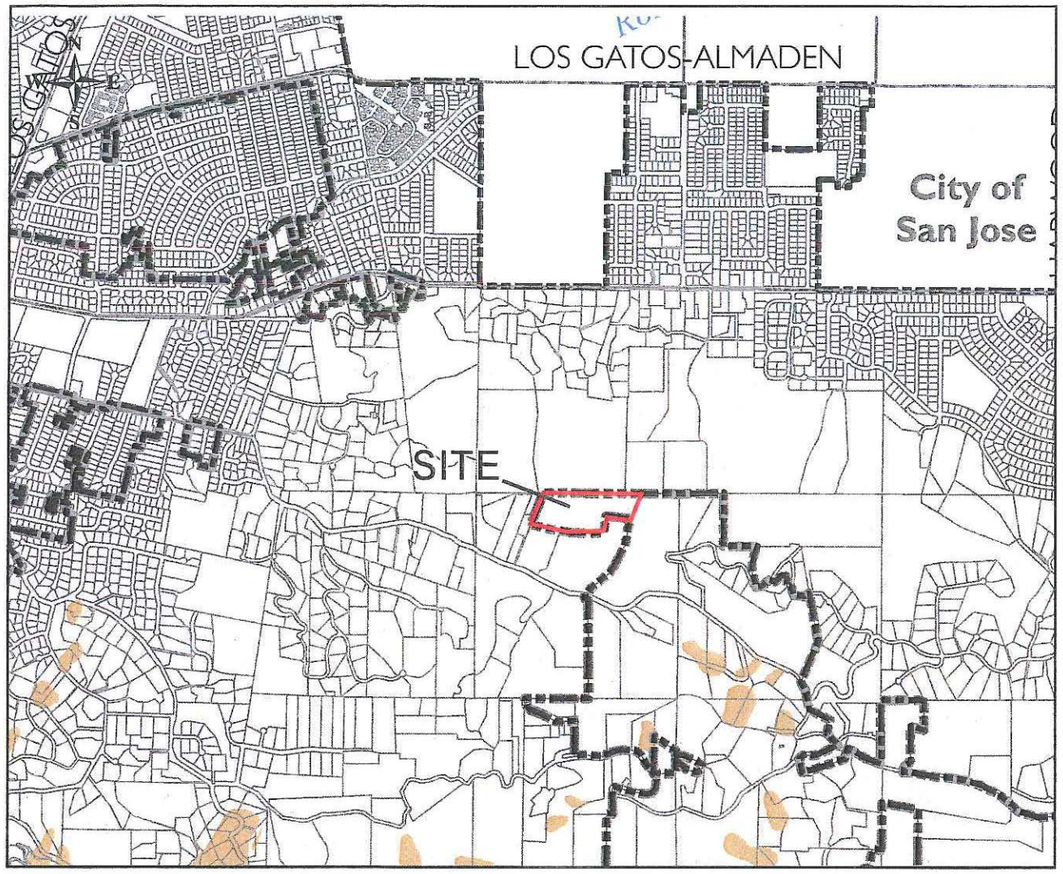

EXPLANATION

- Town Boundary
- Creek
- Severe Landslide Hazard
- Landslide Potential

BASE: Town of Los Gatos General Plan Update; Landslide Hazard Areas, Figure 16-4; SANTA CLARA COUNTY; 2006

TOWN OF LOS GATOS LANDSLIDE HAZARD AREAS MAP

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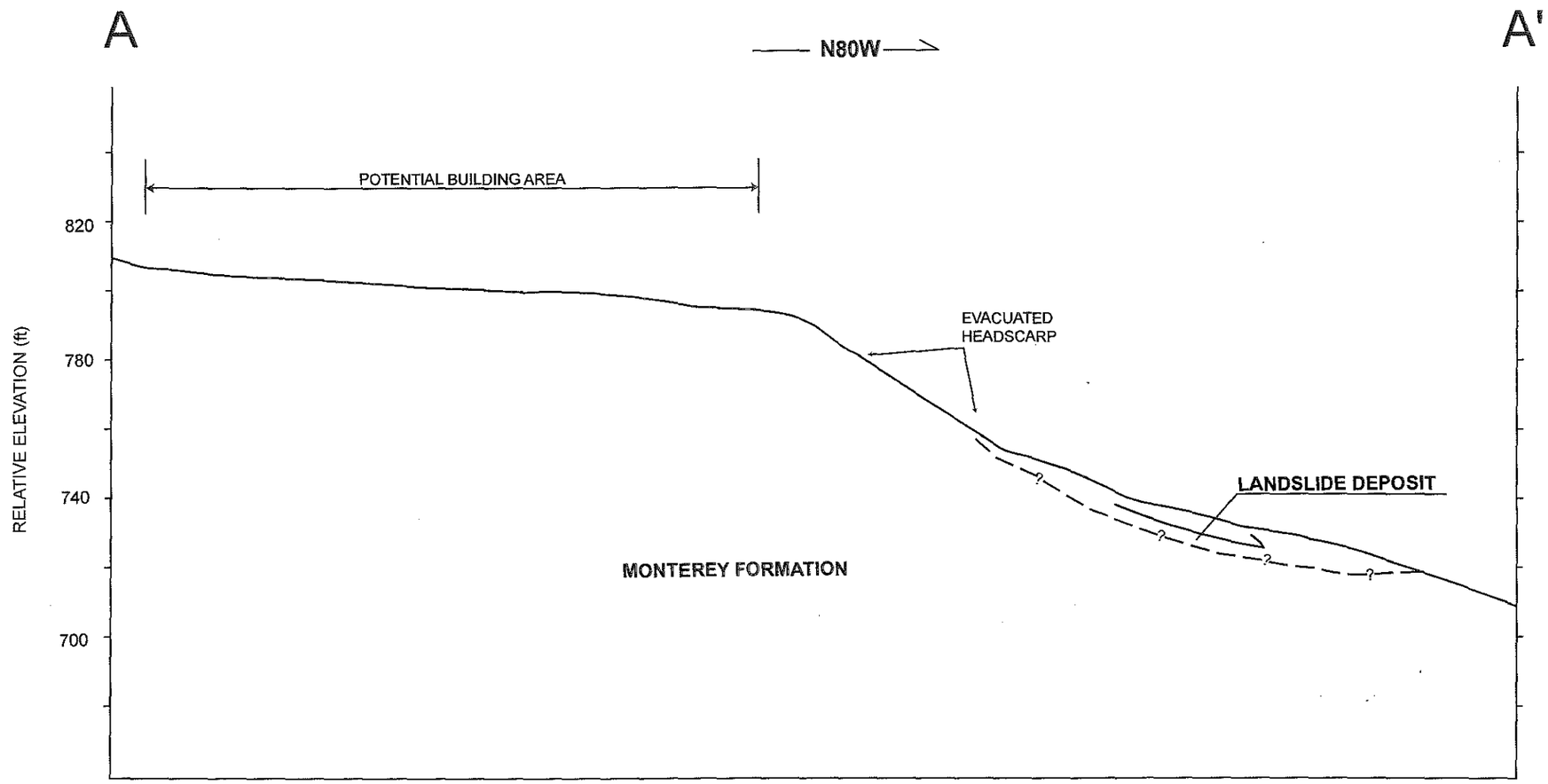

NOTE: This cross-section is a conceptual illustration of general geologic relationships and should not be used for any other purpose.

BASE: Preliminary Site Plan; Sheet 2; HMH; 19 November 2014

GEOLOGIC CROSS-SECTION A-A'				
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RH/CH	1"= 40'	15006C-01L1	March 2015	Figure 9

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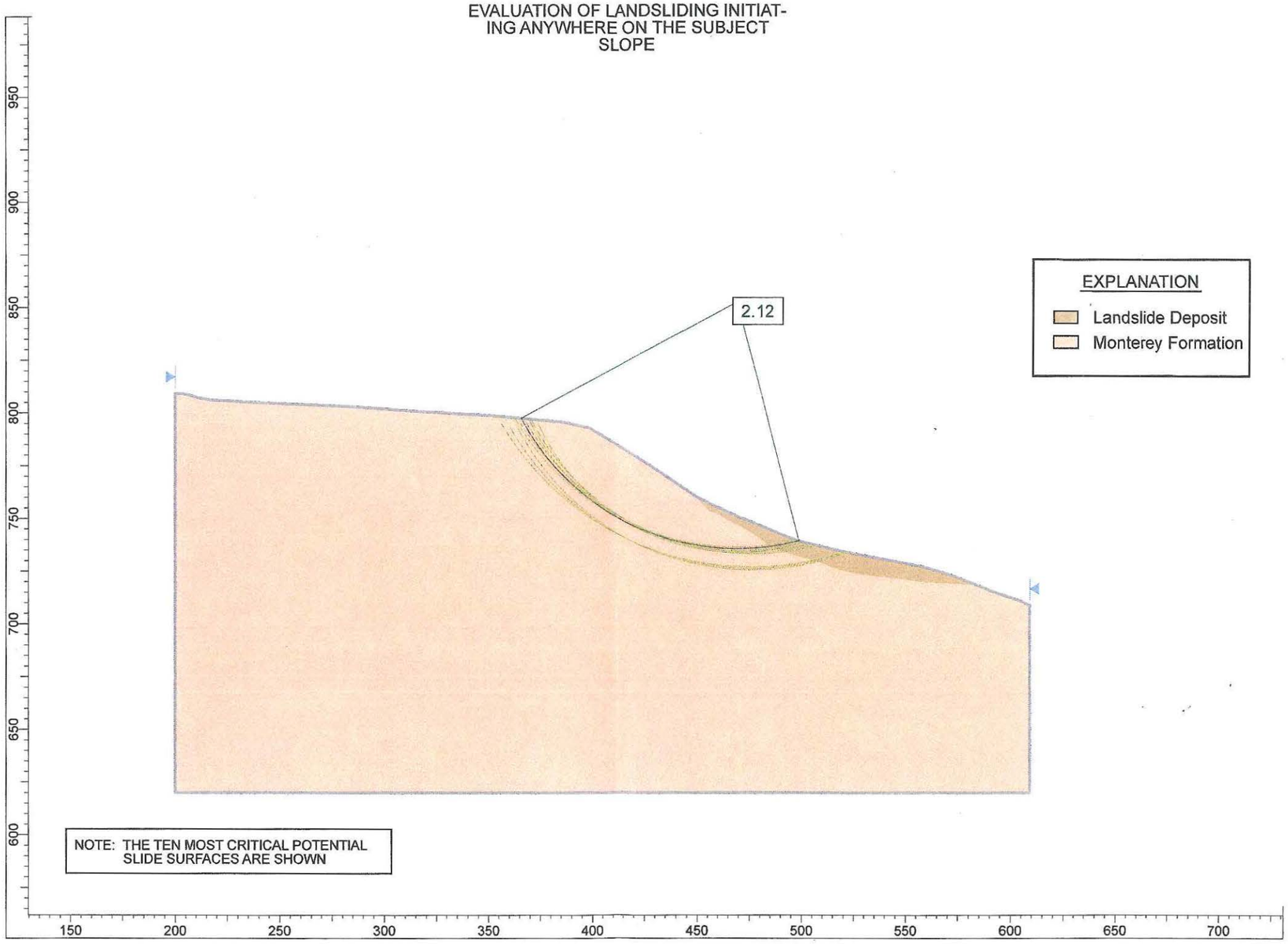
CROSS-SECTION A-A'
STATIC

EVALUATION OF LANDSLIDING INITIATING ANYWHERE ON THE SUBJECT SLOPE



SLOPE STABILITY ANALYSIS NO. 1

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BASE: Slide 5.0; ROCSCIENCE INC.; Version 5.041; Build 7-8-2009

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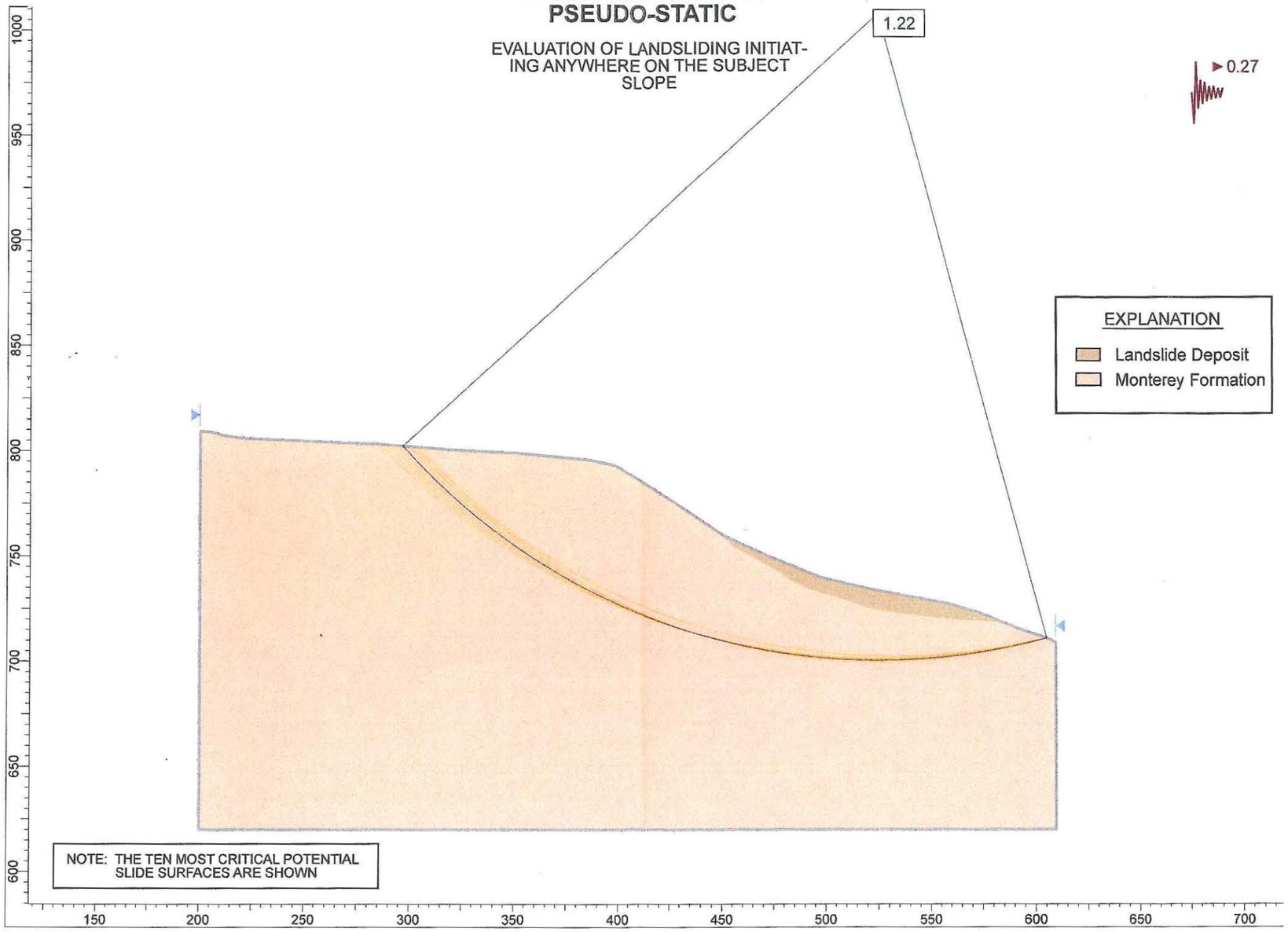
SAHADI PROPERTY
CROSS-SECTION A-A'
PSEUDO-STATIC

EVALUATION OF LANDSLIDING INITIATING ANYWHERE ON THE SUBJECT SLOPE



BASE: Slide 5.0; ROCSCIENCE INC.; Version 5.041; Build 7-8-2009

SLOPE STABILITY ANALYSIS NO. 2				
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RH/CH	As Shown	15006C-01L1	March 2015	Figure 11

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TABLE I

MODIFIED MERCALLI SCALE OF EARTHQUAKE INTENSITIES

I. Not felt by people, except under especially favorable circumstances.

II. Felt only by persons at rest on the upper floors of buildings. Some suspended objects may swing.

III. Felt by some people who are indoors, but it may not be recognized as an earthquake. The vibration is similar to that caused by the passing of light trucks. Hanging objects swing.

IV. Felt by many people who are indoors, by a few outdoors. At night some people are awakenad. Dishes, windows and doors are disturbad: walls make creaking sounds; stationary cars rock noticeably. The sensation is like a heavy object striking a building; the vibration is similar to that caused by the passing of heavy trucks.

V. Felt indoors by practically everyone, outdoors by most people. The direction and duration of the shock can be estimated by people outdoors. At night, sleepers are awakened and some run out of buildings. Liquids are disturbed and sometimes spilled. Small, unstable objects and some furnishings are shifted or upset. Doors close or open.

VI. Felt by everyone, and many people are frightened and run outdoors. Walking is difficult. Small church and school bells ring. Windows, dishes, and glassware are broken; liquids spill; books and other standing objects fall; pictures are knocked from walls; furniture is moved or overturned. Poorly built buildings may be damaged, and weak plaster will crack.

VII. Causes general alarm. Standing upright is very difficult. Persons driving cars also notice the shaking. Damage is negligible in buildings of very good design and construction, slight to moderate in well-built ordinary structures, considerable in poorly built or designed structures. Some chimneys are broken; interiors and furnishings experience considerable damage; architectural ornaments fall. Small slides occur along sand or gravel banks of water channels; concrete irrigation ditches are damaged. Waves form in the water and it becomes muddied.

VIII. General fright and near panic. The steering of cars is difficult. Damage is slight in specially designed earthquake-resistant structures, considerable in well-built ordinary buildings. Poorly built or designed buildings experience partial collapses. Numerous chimneys fall; the walls of frame buildings are damaged; interiors experience heavy damage. Frame houses that are not properly bolted down may move on their foundations. Decayed pilings are broken off. Tress are damaged. Cracks appear in wet ground and on steep slopes. Changes in the flow or temperature of springs and wells are noted.

IX. Panic is general. Interior damage is considerable in specially designed earthquake-resistant structures. Well-built ordinary buildings suffer severe damage, with partial collapses; frame structures thrown out of plumb or shifted off of their foundations. Unreinforced masonry buildings collapse. The ground cracks conspicuously and some underground pipes are broken. Reservoirs are damaged seriously.

X. Most masonry and many frame structures are destroyed. Specially designed earthquake-resistant structures may suffer serious damage. Some well-built bridges are destroyed, and dams, dikes and embankments are seriously damaged. Large landslides are triggered by the shock. Water is thrown onto the banks of canals, rivers and lakes. Sand and mud are shifted horizontally on beaches and flat land. Rails are bent slightly. Many buried pipes and conduits are broken.

XI. Few, if any, masonry structures remain standing. Other structures are severely damaged. Broad fissures, slumps and slides develop in soft or wet soils. Underground pipe lines and conduits are put completely out of service. Rails are severely bent.

XII. Damage is total, with practically all works of construction severely damaged or destroyed. Waves are observed on ground surfaces, and all soft or wet soils are greatly disturbed. Heavy objects are thrown into the air, and large rock masses are displaced.

YANEV,P.,1974, Peace of Mind in Earthquake Country, Chronicle Books, San Francisco, California.

Attachment D
Stormwater Management Plan

Infiltration Trench Sizing using Volume-Based Method

(Based on Adapted CASQA Stormwater BMP Handbook Approach)

	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Area 7	Area 8	Area 9	Area 10	Area 11
Drainage Area (acres)	0.55	0.02	0.19	0.31	0.09	0.17	0.3	0.08	0.32	0.43	2.71
Impervious Area (acres)	0.21	0.02	0.09	0.12	0.09	0.07	0.08	0.08	0.15	0.43	0.33
% Impervious	38%	100%	46%	39%	100%	41%	26%	100%	46%	100%	12%
MAP site	22	22	22	22	22	22	22	22	22	22	22
MAP gage	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
Correction factor	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58
Soil Type	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay
Average slope	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	50%
UBS 1% (inch)	0.37	0.58	0.4	0.38	0.58	0.39	0.35	0.58	0.39	0.58	0.35
UBS 15% (inch)	0.40	0.6	0.42	0.41	0.6	0.41	0.39	0.6	0.42	0.6	0.39
Unit basin storage (inch)	0.39	0.59	0.41	0.40	0.59	0.40	0.38	0.59	0.41	0.59	0.39
Required Volume (ac-ft)	0.03	0.00	0.01	0.02	0.01	0.01	0.01	0.01	0.02	0.03	0.14
Required Volume (cf)	**1,230**	**68**	**451**	**711**	**307**	**393**	**648**	**272**	**752**	**1,460**	**6,072**
Actual Trench Area (sf)	1,020	124	335	850	484	350	530	370	830	1,385	1,380
Gravel Depth (ft)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	13.0
Actual Trench Volume (cf)	**1,428**	**174**	**469**	**1,190**	**678**	**490**	**742**	**518**	**1,162**	**1,939**	**6,279**

**Trench Volume is based on 35% porosity of gravel*

Balance Hydrologics, Inc.®

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www.balancehydro.com • email: office@balancehydro.com

July 22, 2016

Mr. Joey Covey, P.E.
HMH Engineers
1570 Oakland Road
San Jose, California 95131

RE: Summary of Revised Hydromodification Management Modeling, Sahadi Property, Town of Los Gatos, Santa Clara County

Dear Mr. Covey:

Thank you for extending the opportunity to Balance Hydrologics to assist with modeling of the revised hydromodification control design for the Sahadi Property in the Town of Los Gatos. As you know, we have been coordinating with you to address the comments received from the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) and provide updated modeling of the proposed stormwater management infrastructure. This letter report summarizes the work that was completed and provides appropriate model output to demonstrate that the proposed facilities will meet the pertinent requirements for flow-duration control.

Setting and Proposed Stormwater Infrastructure

The Sahadi Property project is located in a part of the Town of Los Gatos that is subject to hydromodification management requirements as set forth in the C.3 Stormwater Handbook prepared by the SCVURPPP and the Municipal Regional Permit issued by the San Francisco Bay Regional Water Quality Control Board.

Soil mapping prepared by the National Resource Conservation Service shows that the entirety of the site is underlain by soils in the Zeppelin-Alumrock complex. These soils are categorized in Hydrologic Soil Group C, indicative of relatively low infiltration rates and correspondingly high runoff potential. However, based on the geotechnical report, a fractured shale layer lies beneath the surface soils with an infiltration rate that ranges from 0.67 to 1.35 inches/hour. The shale layer also makes it difficult to dig beneath the surface and install underground utilities, including storm drain pipes.

To assure full C.3 compliance by taking advantage of the fractured shale, all treatment control facilities at the site are designed to infiltrate into the native soil. This will be accomplished by constructing a series of

infiltration trenches. There will be a minimum of two trenches at each of the proposed lots, and one trench at each side of the proposed roadway.

There are six points of compliance (POCs) at this project site: POC 1 for Area 1, POC 2 for Areas 2-5, POC 3 for Area 6, POC 4 for Areas 8-9, POC 5 for Area 10, and POC 6 for Area 11. The trenches at the residential lots are placed as close to the houses and driveways as possible to limit the amount of pervious runoff that will flow into the trench, which may otherwise cause overflow. The 472-square foot trench on the south side of the roadway in Area 10 is used to capture runoff from the hillslopes, and prevent it from sheet flowing onto the roadway. The 1,385 square-foot trench on the north side of the roadway is used to infiltrate the runoff from the roadway itself. In Area 11, the trenches are placed at the low point of drainage area, and capture runoff from both pervious and impervious areas.

Technical Approach and Modeling

Hydromodification impacts and mitigation were assessed using the Bay Area Hydrology Model (BAHM), a platform specifically developed by local stormwater agencies for this purpose. Data to parameterize the model were taken from site plans and information provided by HMH Engineers. The Sahadi Property project comprises development of a site that is characterized by steep slopes and surface soils with low permeability. The pre-project conditions are modeled by eleven drainage areas, which represent the land area that will be converted into newly added impervious area in the post-project scenario (summarized in Table 1). This combines for a total drainage area that is being considered of 5.18 acres within the entire project area. The rest of the 13-acre site are existing impervious areas and landscaping areas that will remain untouched (i.e. no demolition or construction) and were not considered in this analysis as the runoff from those areas would be the same pre- and post-project. Upon the preparation of a final land plan, the model can be revised as needed. The attached Figure 1 shows a map of the project site with the drainage areas and trench locations.

The assembled input data was entered into the BAHM model, and iterative model runs were carried out to optimize the size of each treatment facility. The BAHM modeling results are provided in the attached Appendix A. Reduced post-project peak flows from the pre-project flows for all POCs show compliance with hydromodification criteria across the full-required control range.

Additionally, the minimum required trench volume was calculated using the SCVURPPP Volume Sizing Criteria. These calculations are shown in Table 2 and are compared with the actual design volume of the trenches, all of which are larger than the required volume. A sample calculation using the worksheet provided in the C.3 Technical Guidance was also performed for Area 1.

Key aspects of the modeling and proposed design include:

- *Sizes of the Treatment Controls*. Figure 1 depicts the locations and sizes of proposed trenches within each drainage area. Facility size varies with the size of the respective drainage area and the mix of the impervious cover therein.

- *Drain Rock (Gravel) Layer*. The infiltration trenches will contain a drain rock layer that varies in depth for the various trenches. Layer depths are displayed in Table 2. The drain rock layer will fill to near the top of the downslope berm.

- *Infiltration Rate*. All trenches are modeled to infiltrate into the native soil at a rate of 0.67 inches/hour, the minimum rate determined by the project geotechnical engineer.

- *Emergency Overflow*. Runoff will be infiltrated into the native soil through the infiltration trenches; however, in the case of large storm events, overflow of most of the trenches will occur in the form of sheet flow down the slopes. For the trenches at the back of the retaining wall, overflow will occur through the weep holes in the wall.

Closing

The BAHM modeling work shows that the proposed distributed treatment control facilities can effectively control for hydromodification impacts at this project site.

Please do not hesitate to contact us if you have any questions or comments related to this scope or the work approach suggested.

Sincerely,

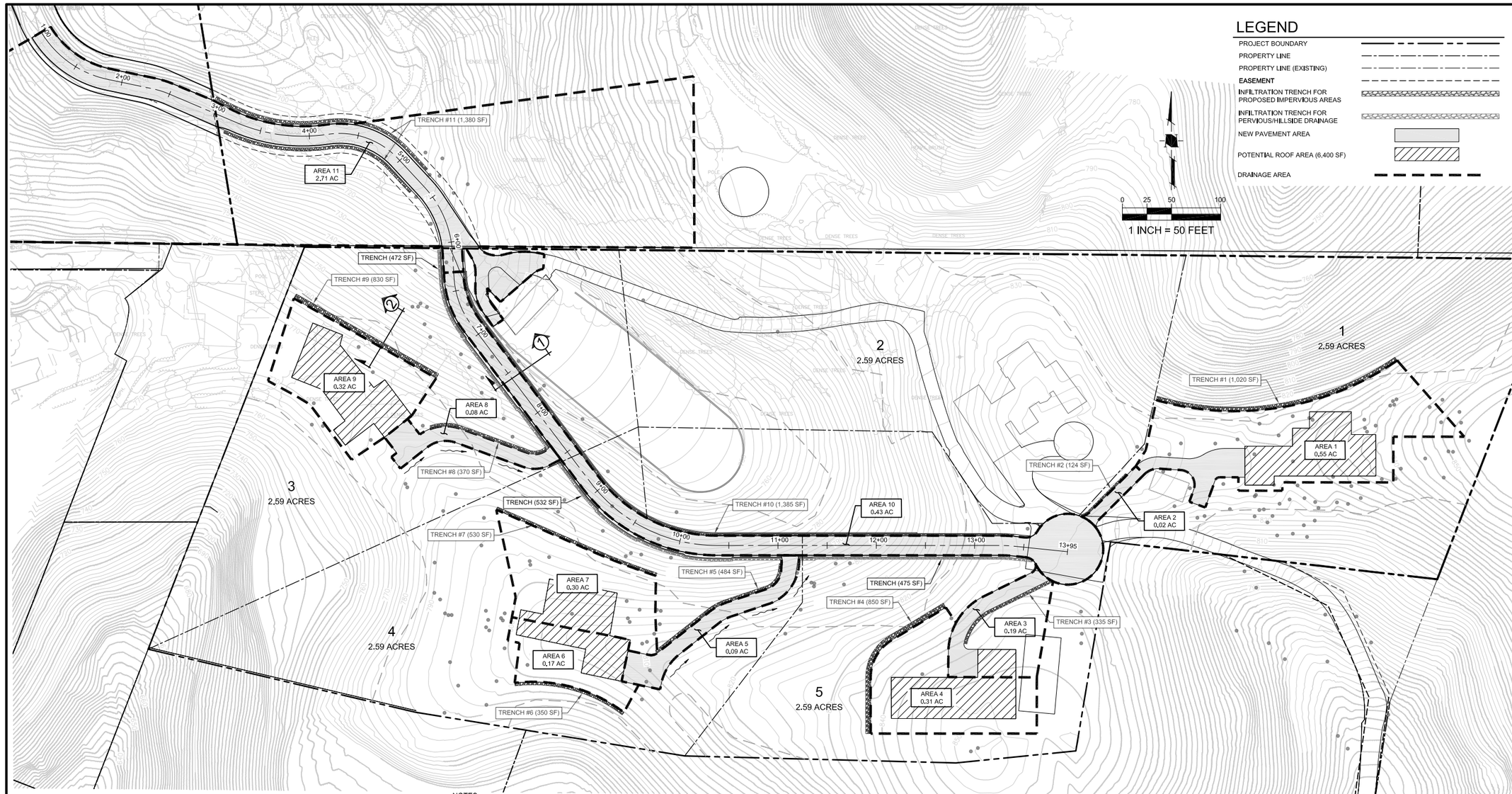
BALANCE HYDROLOGICS, Inc.

Edward D. Ballman, P.E.
Principal Engineer

Lydia Yiu
Engineer/Hydrologist

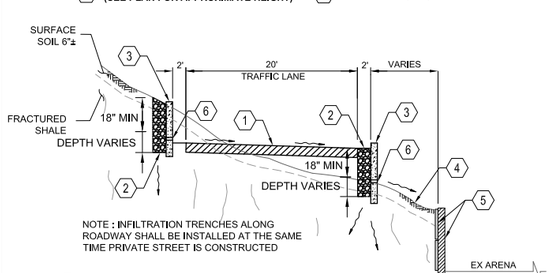
Enclosures: Figure 1 – Site Plan and Drainage Area Map
Table 1 – Summary of input land use parameters
Table 2 – Infiltration Trench Sizing using Volume Based Method
Appendix A – Area 1 Volume Sizing Worksheet
Appendix B – BAHM Project Report

FIGURE 1



NOTES:

1. NEW AC/TRAFFIC LANES
2. INFILTRATION TRENCH (SEE DETAIL '2' FOR TRENCH DETAILS)
3. RETAINING WALL (SEE PLAN FOR APPROXIMATE HEIGHT)
4. EXISTING HILLSIDE
5. EXISTING WOOD RETAINING WALL (HEIGHT VARIES)
6. WEEP HOLES (TYP)



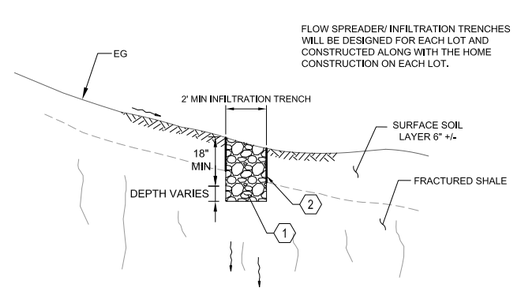
NOTE : INFILTRATION TRENCHES ALONG ROADWAY SHALL BE INSTALLED AT THE SAME TIME PRIVATE STREET IS CONSTRUCTED

1 PRIVATE STREET SECTION

SCALE: NTS

NOTES:

1. 6" MIN OF DRAIN ROCK OR AS REQUIRED TO PROMOTE INFILTRATION INTO FRACTURED SHALE
2. POTENTIAL LINER



2 FLOW SPREADER/ INFILTRATION TRENCH

SCALE: NTS

Drainage Area Breakdown

Area #	Total Area (SF)	Impervious Area (SF)	Pervious Area (SF)	Roof Area (SF)	Driveway/Flatwork (SF)
1	24,065	9,045	15,020	6,400	2,645
2	893	893	0	0	893
3	8,452	3,840	4,612	1,100	2,740
4	13,532	5,300	8,232	5,300	0
5	4,043	4,043	0	0	4,043
6	7,334	3,040	4,294	3,040	0
7	13,187	3,360	9,827	3,360	0
8	3,292	3,292	0	0	3,292
9	14,067	6,400	7,667	6,400	0
10	18,665	18,665	0	0	18,665
11	118,077	14,364	103,713	0	14,364

ESTIMATED C.3 STORMWATER AND IMPERVIOUS/PERVIOUS AREAS

Total Site Area: 13.0 Acres	Existing Area (SF)	Proposed Area (SF)		Total Post-Project Area (SF)
		Replaced	New	
Impervious Area				
Roof (not Green Roof)	15,488	0	25,600	41,088
Parking	0	0	0	0
Sidewalks/Streets/Driveways	24,180	7,900	40,979	65,159
Other (e.g. Tennis Court)	5,870	0	0	0
Total Impervious Area	45,538	7,900	66,579	106,247
Total New and Replaced Impervious Area		74,479		
Pervious Area				
Landscaping	520,742	0	0	460,033
Pervious Paving	0	0	0	0
Other (e.g. Green Roof)	0	0	0	0
Total Pervious Area	520,742			460,033

Note: Impervious area includes the proposed off-site road extension which begins at the terminus of Santella Drive and extends to the northwest corner of the site (approximately 10,000 SF).

HMH
Land Use Entitlements
Land Planning
Landscape Architecture
Civil Engineering
Utility Design
Land Surveying
Stormwater Compliance
1570 Oakland Road
San Jose, CA 95131
(408) 487-2200
HMHca.com

PLANNED DEVELOPMENT ZONING
LANDS OF SAHADI
15215 SHANNON ROAD
SANTA CLARA COUNTY, CALIFORNIA

NO	DATE	DESCRIPTION

PROJECT NO:	4130.50
CAD DWG FILE:	413050 SW01.DWG
DESIGNED BY:	
DRAWN BY:	
CHECKED BY:	DW
DATE:	JULY 13, 2016
SCALE:	NOT TO SCALE

© HMH

CONCEPTUAL STORMWATER CONTROL PLAN

17.0

S:\PROJECTS\413050\PL\413050 SW01.DWG

PLOTTED: 7/18/2016 6:33 AM

TABLES

Table 1. Summary of input land use parameters for BAHM modeling, Sahadi Property, Town of Los Gatos

	Pre-Project Drainage Areas (acres)										
Land Use	**Area 1**	**Area 2**	**Area 3**	**Area 4**	**Area 5**	**Area 6**	**Area 7**	**Area 8**	**Area 9**	**Area 10**	**Area 11**
Pervious											
C/D, Grass, Mod (5-10%)	0	0	0	0	0	0	0	0	0.32	0	0
C/D, Grass, Steep (10-20%)	0.55	0.02	0.18	0.30	0.09	0.17	0.30	0.08	0	0.43	0
C/D, Grass, Very Steep (>20%)	0	0	0	0	0	0	0	0	0	0	2.71
Impervious											
Driveways, Steep (10-20%)	0	0	0	0	0	0	0	0	0	0	0
Roof area	0	0	0	0	0	0	0	0	0	0	0
Sidewalks, Flat (0-5%)	0	0	0.016	0.01	0	0	0	0	0	0	0
TOTAL	**0.55**	**0.02**	**0.20**	**0.31**	**0.09**	**0.17**	**0.30**	**0.08**	**0.32**	**0.43**	**2.71**

	Post-Project Drainage Areas (acres)										
Land Use	**Area 1**	**Area 2**	**Area 3**	**Area 4**	**Area 5**	**Area 6**	**Area 7**	**Area 8**	**Area 9**	**Area 10**	**Area 11**
Pervious											
C/D, Grass, Mod (5-10%)	0	0	0	0	0	0	0	0	0	0	0
C/D, Grass, Steep (10-20%)	0.340	0	0.106	0.19	0	0.1	0.226	0	0.176	0	0
C/D, Grass, Very Steep (>20%)	0	0	0	0	0	0	0	0	0	0	2.38
Impervious											
Driveways, Steep (10-20%)	0.061	0.02	0.06	0	0.09	0	0	0.076	0	0.43	0.33
Roof area	0.147	0	0.025	0.120	0	0.07	0.080	0	0.147	0	0
Sidewalks, Flat (0-5%)	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**0.55**	**0.02**	**0.19**	**0.31**	**0.09**	**0.17**	**0.31**	**0.08**	**0.32**	**0.43**	**2.71**

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Table 2. Infiltration Trench Sizing using Volume-Based Method

(Based on Adapted CASQA Stormwater BMP Handbook Approach)

	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Area 7	Area 8	Area 9	Area 10	Area 11
Drainage Area (acres)	0.55	0.02	0.19	0.31	0.09	0.17	0.3	0.08	0.32	0.43	2.71
Impervious Area (acres)	0.21	0.02	0.09	0.12	0.09	0.07	0.08	0.08	0.15	0.43	0.33
% Impervious	38%	100%	46%	39%	100%	41%	26%	100%	46%	100%	12%
MAP site	22	22	22	22	22	22	22	22	22	22	22
MAP gage	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
Correction factor	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58
Soil Type	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay
Average slope	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	50%
UBS 1% (inch)	0.37	0.58	0.4	0.38	0.58	0.39	0.35	0.58	0.39	0.58	0.35
UBS 15% (inch)	0.40	0.6	0.42	0.41	0.6	0.41	0.39	0.6	0.42	0.6	0.39
Unit basin storage (inch)	0.39	0.59	0.41	0.40	0.59	0.40	0.38	0.59	0.41	0.59	0.39
Required Volume (ac-ft)	0.028	0.002	0.010	0.016	0.007	0.009	0.015	0.006	0.017	0.034	0.139
Required Volume (cf)	**1,230**	**68**	**451**	**711**	**307**	**393**	**648**	**272**	**752**	**1,460**	**6,072**
Actual Trench Area (sf)	1,020	124	335	850	484	350	530	370	830	1,385	1,380
Gravel Depth (ft)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	13.0
Actual Trench Volume (cf)	**1,428**	**174**	**469**	**1,190**	**678**	**490**	**742**	**518**	**1,162**	**1,939**	**6,279**

**Trench Volume is based on 35% porosity of gravel*

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APPENDIX A

Area 1 Volume Sizing Worksheet

Area 1

Section II. Sizing for Volume-Based Treatment Measures, continued

Section II.B. — Sizing Volume-Based Treatment Measures based on the Adapted CASQA Stormwater BMP Handbook Approach

The equation that will be used to size the BMP is:

BMP Volume = (Correction Factor) × (Unit Storage) × (Drainage Area to the BMP)

Step 1. Determine the drainage area for the BMP, A = .55 acres

Step 2. Determine percent imperviousness of the drainage area:

a. Estimate the amount of impervious surface (rooftops, hardscape, streets, and sidewalks, etc.) in the area draining to the BMP: .21 acres

b. % impervious area=(amount of impervious area/drainage area for the BMP) × 100
% impervious area= **(Step 2.a/Step 1)** × 100
% impervious area= 38 %

Step 3. Find the mean annual precipitation at the site (MAP_{site}). To do so, estimate where the site is on Figure B-1 and estimate the mean annual precipitation in inches from the rain line (isopleth) nearest to the project site.[6] Interpolate between isopleths if necessary.

MAP_{site} = 22 inches

Step 4. Identify the reference rain gage closest to the project site from Table B-2b and record the MAP_{gage}:

MAP_{gage} = 13.9 inches

Table B-2b: Precipitation Data for Three Reference Gages

Reference Rain Gages	Mean Annual Precipitation (MAP_{gage}) (in)
San Jose Airport	13.9
Palo Alto	13.7
Morgan Hill	19.5

[6] Check with the local municipality to determine if more detailed maps are available for locating the site and estimating MAP.

Section II. Sizing for Volume-Based Treatment Measures, continued

Section II.B. —Adapted CASQA Stormwater BMP Handbook Approach (continued)

Step 5 Determine the rain gage correction factor for the precipitation at the site using the information from **Step 3** and **Step 4**.

Correction Factor = MAP_{site} (**Step 3**)/MAP_{gage} (**Step 4**)

Correction Factor = 1.58

Step 6. Identify the representative soil type for the BMP drainage area.

a) Identify from Figure B-1 or from site soils data, the soil type that is representative of the pervious portion of the project shown here in order of increasing infiltration capability:

✓ Clay (D) ____ Sandy Clay (D) ____ Clay Loam (D)

____ Silt Loam/Loam (B) ____ Not Applicable (100% Impervious)

b) Does the site planning allow for protection of natural areas and associated vegetation and soils so that the soils outside the building footprint are not graded/compacted? ____ (Y/N)

If your answer is no, and the soil will be compacted during site preparation and grading, the soil's infiltration ability will be decreased. Modify your answer to a soil with a lower infiltration rate (e.g., Silt Loam to Clay Loam or Clay).

Modified soil type: ____

7. Determine the average slope for the drainage area for the BMP: 10 %

8. Determine the unit basin storage volume from sizing curves.

a) Slope ≤ 1%

Use the figure entitled "Unit Basin Volume for 80% Capture, 1% Slope" corresponding to the nearest rain gage: Figure B-2, B-3, or B-4 for San Jose, Palo Alto, or Morgan Hill, respectively. Find the percent imperviousness of the drainage area (see answer to **Step 2**, above) on the x-axis. From there, find the line corresponding to the soil type (from **Step 6**), and obtain the unit basin storage on the y-axis.

Unit Basin Storage for 1% slope ($UBS_{1\%}$) = .37 (inches)

b) Slope ≥ 15%

Use the figure entitled "Unit Basin Volume for 80% Capture, 15% Slope" corresponding to the nearest rain gage: Figure B-5, B-6, or B-7 for San Jose, Palo Alto, or Morgan Hill, respectively. Find the percent imperviousness of the drainage area (see answer to **Step 2**, above) on the x-axis. From there, find the line corresponding to the soil type (from **Step 6**), and obtain the unit basin storage on the y-axis.

Unit Basin Storage for 15% slope ($UBS_{15\%}$) = .40 (inches)

Section II. Sizing for Volume-Based Treatment Measures, continued

Section II.B. —Adapted CASQA Stormwater BMP Handbook Approach (continued)

c) Slope > 1% and < 15%

Find the unit basin volumes for 1% and 15% using the techniques in **Steps 8.a** and **8.b** and interpolate by applying a slope correction factor per the following formula:

$$UBS_x = UBS_{1\%} + (UBS_{15\%} - UBS_{1\%}) \times (X\%-1\%) / (15\% - 1\%)$$
$$= (\textbf{Step 8a}) + (\textbf{Step 8b- Step 8a}) \times (X\%-1\%)/(15\%-1\%)$$

Where UBS_x = Unit Basin Storage volume for drainage area of intermediate slope, X %

Unit Basin Storage volume (UBS_x) = .39 (inches)
(corrected for slope of site)

9. Determine the BMP Design Volume, using the following equation:

Design Volume = Rain Gage Correction Factor × Unit Basin Storage Volume × Drainage Area

Design Volume = (**Step 5**) × (**Step 8**) × (**Step 1**) × 1 foot/12 inch

Design Volume = .03 acre-feet

APPENDIX B

BAHM Project Report

BAHM2013

PROJECT REPORT

General Model Information

Project Name:	216053 BAHM 07-14-2016
Site Name:	
Site Address:	
City:	
Report Date:	7/21/2016
Gage:	San Jose
Data Start:	1959/10/01
Data End:	2000/09/30
Timestep:	Hourly
Precip Scale:	1.448
Version Date:	2016/07/08

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year
Low Flow Threshold for POC2:	10 Percent of the 2 Year
High Flow Threshold for POC2:	10 Year
Low Flow Threshold for POC3:	10 Percent of the 2 Year
High Flow Threshold for POC3:	10 Year
Low Flow Threshold for POC4:	10 Percent of the 2 Year
High Flow Threshold for POC4:	10 Year
Low Flow Threshold for POC5:	10 Percent of the 2 Year
High Flow Threshold for POC5:	10 Year
Low Flow Threshold for POC6:	10 Percent of the 2 Year
High Flow Threshold for POC6:	10 Year

Landuse Basin Data
Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Grass,Ste(10-20)	0.55
Pervious Total	0.55
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.55

Element Flows To:

Surface	Interflow	Groundwater

Basin 2

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Grass,Ste(10-20)	0.02
Pervious Total	0.02
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.02

Element Flows To:

Surface	Interflow	Groundwater

Basin 3

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Grass,Ste(10-20)	0.18
Pervious Total	0.18
Impervious Land Use	acre
Sidewalks,Flat(0-5%)	0.016
Impervious Total	0.016
Basin Total	0.196

Element Flows To:

Surface	Interflow	Groundwater

Basin 4

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Grass,Ste(10-20)	0.297
Pervious Total	0.297
Impervious Land Use	acre
Sidewalks,Flat(0-5%)	0.013
Impervious Total	0.013
Basin Total	0.31

Element Flows To:

Surface	Interflow	Groundwater

Basin 5

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Grass,Ste(10-20)	0.09
Pervious Total	0.09
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.09

Element Flows To:

Surface	Interflow	Groundwater

Basin 6

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Grass,Ste(10-20)	0.17
Pervious Total	0.17
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.17

Element Flows To:

Surface	Interflow	Groundwater

Basin 7

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Grass,Ste(10-20)	0.3
Pervious Total	0.3
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.3

Element Flows To:

Surface	Interflow	Groundwater

Basin 8

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Grass,Ste(10-20)	0.08
Pervious Total	0.08
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.08

Element Flows To:

Surface	Interflow	Groundwater

Basin 9

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Grass,Mod(5-10%)	0.32
Pervious Total	0.32
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.32

Element Flows To:

Surface	Interflow	Groundwater

Basin 10

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Grass,Ste(10-20)	0.43
Pervious Total	0.43
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.43

Element Flows To:

Surface	Interflow	Groundwater

Basin 11

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Grass,Very(>20%)	2.71
Pervious Total	2.71
Impervious Land Use	acre
Impervious Total	0
Basin Total	2.71

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Grass,Ste(10-20)	0.34
Pervious Total	0.34
Impervious Land Use	acre
Roof Area	0.147
Driveways,St(10-20%)	0.061
Impervious Total	0.208
Basin Total	0.548

Element Flows To:

Surface	Interflow	Groundwater
Surface Trench 1	Surface Trench 1	

Basin 2

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
Driveways,St(10-20%)	0.02
Impervious Total	0.02
Basin Total	0.02

Element Flows To:

Surface	Interflow	Groundwater
Surface Trench 2	Surface Trench 2	

Basin 3

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Grass,Ste(10-20)	0.106
Pervious Total	0.106
Impervious Land Use	acre
Roof Area	0.025
Driveways,St(10-20%)	0.06
Impervious Total	0.085
Basin Total	0.191

Element Flows To:

Surface	Interflow	Groundwater
Surface Trench 3	Surface Trench 3	

Basin 4

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Grass,Ste(10-20)	0.19
Pervious Total	0.19
Impervious Land Use	acre
Roof Area	0.12
Impervious Total	0.12
Basin Total	0.31

Element Flows To:

Surface	Interflow	Groundwater
Surface Trench 4	Surface Trench 4	

Basin 5

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
Driveways,St(10-20%)	0.09
Impervious Total	0.09
Basin Total	0.09

Element Flows To:

Surface	Interflow	Groundwater
Surface Trench 5	Surface Trench 5	

Basin 6

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Grass,Ste(10-20)	0.1
Pervious Total	0.1
Impervious Land Use	acre
Roof Area	0.07
Impervious Total	0.07
Basin Total	0.17

Element Flows To:

Surface	Interflow	Groundwater
Surface Trench 6	Surface Trench 6	

Basin 7

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Grass,Ste(10-20)	0.226
Pervious Total	0.226
Impervious Land Use	acre
Roof Area	0.08
Impervious Total	0.08
Basin Total	0.306

Element Flows To:

Surface	Interflow	Groundwater
Surface Trench 7	Surface Trench 7	

Basin 8

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
Driveways,St(10-20%)	0.076
Impervious Total	0.076
Basin Total	0.076

Element Flows To:

Surface	Interflow	Groundwater
Surface Trench 8	Surface Trench 8	

Basin 9

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Grass,Ste(10-20)	0.176
Pervious Total	0.176
Impervious Land Use	acre
Roof Area	0.147
Impervious Total	0.147
Basin Total	0.323

Element Flows To:

Surface	Interflow	Groundwater
Surface Trench 9	Surface Trench 9	

Basin 10

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
Driveways,St(10-20%)	0.43
Impervious Total	0.43
Basin Total	0.43

Element Flows To:

Surface	Interflow	Groundwater
Surface Trench 10	Surface Trench 10	

Basin 11

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Grass,Very(>20%)	2.38
Pervious Total	2.38
Impervious Land Use	acre
Driveways,St(10-20%)	0.33
Impervious Total	0.33
Basin Total	2.71

Element Flows To:

Surface	Interflow	Groundwater
Surface Trench 11	Surface Trench 11	

Routing Elements
Predeveloped Routing

Mitigated Routing

Trench 1

Bottom Length:	255.00 ft.
Bottom Width:	4.00 ft.
Material thickness of first layer:	4
Material type for first layer:	GRAVEL
Material thickness of second layer:	0
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	0.67
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	18.355
Total Volume Through Riser (ac-ft.):	5.213
Total Volume Through Facility (ac-ft.):	23.568
Percent Infiltrated:	77.88
Total Precip Applied to Facility:	1.328
Total Evap From Facility:	0.436
Underdrain not used	
Discharge Structure	
Riser Height: 0 ft.	
Riser Diameter: 6 in.	
Element Flows To:	
Outlet 1 Outlet 2	

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0234	0.0000	0.0000	0.0000
0.0467	0.0234	0.0005	0.0000	0.0000
0.0934	0.0234	0.0009	0.0000	0.0016
0.1401	0.0234	0.0014	0.0000	0.0038
0.1868	0.0234	0.0018	0.0000	0.0072
0.2335	0.0234	0.0023	0.0000	0.0120
0.2802	0.0234	0.0027	0.0000	0.0158
0.3269	0.0234	0.0032	0.0000	0.0158
0.3736	0.0234	0.0036	0.0000	0.0158
0.4203	0.0234	0.0041	0.0000	0.0158
0.4670	0.0234	0.0045	0.0000	0.0158
0.5137	0.0234	0.0050	0.0000	0.0158
0.5604	0.0234	0.0054	0.0000	0.0158
0.6071	0.0234	0.0059	0.0000	0.0158
0.6538	0.0234	0.0064	0.0000	0.0158
0.7005	0.0234	0.0068	0.0000	0.0158
0.7473	0.0234	0.0073	0.0000	0.0158
0.7940	0.0234	0.0077	0.0000	0.0158
0.8407	0.0234	0.0082	0.0000	0.0158
0.8874	0.0234	0.0086	0.0000	0.0158
0.9341	0.0234	0.0091	0.0000	0.0158
0.9808	0.0234	0.0095	0.0000	0.0158
1.0275	0.0234	0.0100	0.0000	0.0158
1.0742	0.0234	0.0104	0.0000	0.0158
1.1209	0.0234	0.0109	0.0000	0.0158
1.1676	0.0234	0.0113	0.0000	0.0158

1.2143	0.0234	0.0118	0.0000	0.0158
1.2610	0.0234	0.0123	0.0000	0.0158
1.3077	0.0234	0.0127	0.0000	0.0158
1.3544	0.0234	0.0132	0.0000	0.0158
1.4011	0.0234	0.0136	0.0000	0.0158
1.4478	0.0234	0.0141	0.0000	0.0158
1.4945	0.0234	0.0145	0.0000	0.0158
1.5412	0.0234	0.0150	0.0000	0.0158
1.5879	0.0234	0.0154	0.0000	0.0158
1.6346	0.0234	0.0159	0.0000	0.0158
1.6813	0.0234	0.0163	0.0000	0.0158
1.7280	0.0234	0.0168	0.0000	0.0158
1.7747	0.0234	0.0172	0.0000	0.0158
1.8214	0.0234	0.0177	0.0000	0.0158
1.8681	0.0234	0.0182	0.0000	0.0158
1.9148	0.0234	0.0186	0.0000	0.0158
1.9615	0.0234	0.0191	0.0000	0.0158
2.0082	0.0234	0.0195	0.0000	0.0158
2.0549	0.0234	0.0200	0.0000	0.0158
2.1016	0.0234	0.0204	0.0000	0.0158
2.1484	0.0234	0.0209	0.0000	0.0158
2.1951	0.0234	0.0213	0.0000	0.0158
2.2418	0.0234	0.0218	0.0000	0.0158
2.2885	0.0234	0.0222	0.0000	0.0158
2.3352	0.0234	0.0227	0.0000	0.0158
2.3819	0.0234	0.0231	0.0000	0.0158
2.4286	0.0234	0.0236	0.0000	0.0158
2.4753	0.0234	0.0241	0.0000	0.0158
2.5220	0.0234	0.0245	0.0000	0.0158
2.5687	0.0234	0.0250	0.0000	0.0158
2.6154	0.0234	0.0254	0.0000	0.0158
2.6621	0.0234	0.0259	0.0000	0.0158
2.7088	0.0234	0.0263	0.0000	0.0158
2.7555	0.0234	0.0268	0.0000	0.0158
2.8022	0.0234	0.0272	0.0000	0.0158
2.8489	0.0234	0.0277	0.0000	0.0158
2.8956	0.0234	0.0281	0.0000	0.0158
2.9423	0.0234	0.0286	0.0000	0.0158
2.9890	0.0234	0.0290	0.0000	0.0158
3.0357	0.0234	0.0295	0.0000	0.0158
3.0824	0.0234	0.0300	0.0000	0.0158
3.1291	0.0234	0.0304	0.0000	0.0158
3.1758	0.0234	0.0309	0.0000	0.0158
3.2225	0.0234	0.0313	0.0000	0.0158
3.2692	0.0234	0.0318	0.0000	0.0158
3.3159	0.0234	0.0322	0.0000	0.0158
3.3626	0.0234	0.0327	0.0000	0.0158
3.4093	0.0234	0.0331	0.0000	0.0158
3.4560	0.0234	0.0336	0.0000	0.0158
3.5027	0.0234	0.0340	0.0000	0.0158
3.5495	0.0234	0.0345	0.0000	0.0158
3.5962	0.0234	0.0349	0.0000	0.0158
3.6429	0.0234	0.0354	0.0000	0.0158
3.6896	0.0234	0.0359	0.0000	0.0158
3.7363	0.0234	0.0363	0.0000	0.0158
3.7830	0.0234	0.0368	0.0000	0.0158
3.8297	0.0234	0.0372	0.0000	0.0158
3.8764	0.0234	0.0377	0.0000	0.0158

3.9231	0.0234	0.0381	0.0000	0.0158
3.9698	0.0234	0.0386	0.0000	0.0158
4.0000	0.0234	0.0389	0.0000	0.0158

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.0000	0.0234	0.0389	0.0000	11.849	0.0000
4.0467	0.0234	0.0400	0.0533	11.849	0.0000
4.0934	0.0234	0.0411	0.1460	11.986	0.0000
4.1401	0.0234	0.0422	0.2471	12.123	0.0000
4.1868	0.0234	0.0432	0.3293	12.260	0.0000
4.2335	0.0234	0.0443	0.3781	12.396	0.0000
4.2500	0.0234	0.0447	0.4168	12.445	0.0000

Surface Trench 1

Element Flows To:

Outlet 1	Outlet 2
	Trench 1

Trench 2

Bottom Length:	31.00 ft.
Bottom Width:	5.00 ft.
Material thickness of first layer:	4
Material type for first layer:	GRAVEL
Material thickness of second layer:	0
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	0.67
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	0.508
Total Volume Through Riser (ac-ft.):	0.914
Total Volume Through Facility (ac-ft.):	1.422
Percent Infiltrated:	35.72
Total Precip Applied to Facility:	0.163
Total Evap From Facility:	0.052
Underdrain not used	
Discharge Structure	
Riser Height:	0 ft.
Riser Diameter:	12 in.
Element Flows To:	
Outlet 1	Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0036	0.0000	0.0000	0.0000
0.0467	0.0036	0.0001	0.0000	0.0000
0.0934	0.0036	0.0001	0.0000	0.0002
0.1401	0.0036	0.0002	0.0000	0.0006
0.1868	0.0036	0.0003	0.0000	0.0011
0.2335	0.0036	0.0003	0.0000	0.0018
0.2802	0.0036	0.0004	0.0000	0.0024
0.3269	0.0036	0.0005	0.0000	0.0024
0.3736	0.0036	0.0006	0.0000	0.0024
0.4203	0.0036	0.0006	0.0000	0.0024
0.4670	0.0036	0.0007	0.0000	0.0024
0.5137	0.0036	0.0008	0.0000	0.0024
0.5604	0.0036	0.0008	0.0000	0.0024
0.6071	0.0036	0.0009	0.0000	0.0024
0.6538	0.0036	0.0010	0.0000	0.0024
0.7005	0.0036	0.0010	0.0000	0.0024
0.7473	0.0036	0.0011	0.0000	0.0024
0.7940	0.0036	0.0012	0.0000	0.0024
0.8407	0.0036	0.0012	0.0000	0.0024
0.8874	0.0036	0.0013	0.0000	0.0024
0.9341	0.0036	0.0014	0.0000	0.0024
0.9808	0.0036	0.0014	0.0000	0.0024
1.0275	0.0036	0.0015	0.0000	0.0024
1.0742	0.0036	0.0016	0.0000	0.0024
1.1209	0.0036	0.0017	0.0000	0.0024
1.1676	0.0036	0.0017	0.0000	0.0024
1.2143	0.0036	0.0018	0.0000	0.0024
1.2610	0.0036	0.0019	0.0000	0.0024

1.3077	0.0036	0.0019	0.0000	0.0024
1.3544	0.0036	0.0020	0.0000	0.0024
1.4011	0.0036	0.0021	0.0000	0.0024
1.4478	0.0036	0.0021	0.0000	0.0024
1.4945	0.0036	0.0022	0.0000	0.0024
1.5412	0.0036	0.0023	0.0000	0.0024
1.5879	0.0036	0.0023	0.0000	0.0024
1.6346	0.0036	0.0024	0.0000	0.0024
1.6813	0.0036	0.0025	0.0000	0.0024
1.7280	0.0036	0.0026	0.0000	0.0024
1.7747	0.0036	0.0026	0.0000	0.0024
1.8214	0.0036	0.0027	0.0000	0.0024
1.8681	0.0036	0.0028	0.0000	0.0024
1.9148	0.0036	0.0028	0.0000	0.0024
1.9615	0.0036	0.0029	0.0000	0.0024
2.0082	0.0036	0.0030	0.0000	0.0024
2.0549	0.0036	0.0030	0.0000	0.0024
2.1016	0.0036	0.0031	0.0000	0.0024
2.1484	0.0036	0.0032	0.0000	0.0024
2.1951	0.0036	0.0032	0.0000	0.0024
2.2418	0.0036	0.0033	0.0000	0.0024
2.2885	0.0036	0.0034	0.0000	0.0024
2.3352	0.0036	0.0034	0.0000	0.0024
2.3819	0.0036	0.0035	0.0000	0.0024
2.4286	0.0036	0.0036	0.0000	0.0024
2.4753	0.0036	0.0037	0.0000	0.0024
2.5220	0.0036	0.0037	0.0000	0.0024
2.5687	0.0036	0.0038	0.0000	0.0024
2.6154	0.0036	0.0039	0.0000	0.0024
2.6621	0.0036	0.0039	0.0000	0.0024
2.7088	0.0036	0.0040	0.0000	0.0024
2.7555	0.0036	0.0041	0.0000	0.0024
2.8022	0.0036	0.0041	0.0000	0.0024
2.8489	0.0036	0.0042	0.0000	0.0024
2.8956	0.0036	0.0043	0.0000	0.0024
2.9423	0.0036	0.0043	0.0000	0.0024
2.9890	0.0036	0.0044	0.0000	0.0024
3.0357	0.0036	0.0045	0.0000	0.0024
3.0824	0.0036	0.0046	0.0000	0.0024
3.1291	0.0036	0.0046	0.0000	0.0024
3.1758	0.0036	0.0047	0.0000	0.0024
3.2225	0.0036	0.0048	0.0000	0.0024
3.2692	0.0036	0.0048	0.0000	0.0024
3.3159	0.0036	0.0049	0.0000	0.0024
3.3626	0.0036	0.0050	0.0000	0.0024
3.4093	0.0036	0.0050	0.0000	0.0024
3.4560	0.0036	0.0051	0.0000	0.0024
3.5027	0.0036	0.0052	0.0000	0.0024
3.5495	0.0036	0.0052	0.0000	0.0024
3.5962	0.0036	0.0053	0.0000	0.0024
3.6429	0.0036	0.0054	0.0000	0.0024
3.6896	0.0036	0.0054	0.0000	0.0024
3.7363	0.0036	0.0055	0.0000	0.0024
3.7830	0.0036	0.0056	0.0000	0.0024
3.8297	0.0036	0.0057	0.0000	0.0024
3.8764	0.0036	0.0057	0.0000	0.0024
3.9231	0.0036	0.0058	0.0000	0.0024
3.9698	0.0036	0.0059	0.0000	0.0024

4.0000	0.0036	0.0059	0.0000	0.0024

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.0000	0.0036	0.0059	0.0000	1.8006	0.0000
4.0467	0.0036	0.0061	0.1070	1.8006	0.0000
4.0934	0.0036	0.0062	0.3014	1.8214	0.0000
4.1401	0.0036	0.0064	0.5479	1.8422	0.0000
4.1868	0.0036	0.0066	0.8261	1.8630	0.0000
4.2335	0.0036	0.0067	1.1162	1.8838	0.0000
4.2500	0.0036	0.0068	1.3977	1.8911	0.0000

Surface Trench 2

Element Flows To:

Outlet 1	Outlet 2
	Trench 2

Trench 3

Bottom Length:	71.00 ft.
Bottom Width:	5.00 ft.
Material thickness of first layer:	4
Material type for first layer:	GRAVEL
Material thickness of second layer:	0
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	0.67
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	4.583
Total Volume Through Riser (ac-ft.):	4.086
Total Volume Through Facility (ac-ft.):	8.669
Percent Infiltrated:	52.87
Total Precip Applied to Facility:	0.447
Total Evap From Facility:	0.145
Underdrain not used	
Discharge Structure	
Riser Height:	0 ft.
Riser Diameter:	12 in.
Element Flows To:	
Outlet 1	Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0081	0.0000	0.0000	0.0000
0.0467	0.0081	0.0002	0.0000	0.0000
0.0934	0.0081	0.0003	0.0000	0.0006
0.1401	0.0081	0.0005	0.0000	0.0013
0.1868	0.0081	0.0006	0.0000	0.0025
0.2335	0.0081	0.0008	0.0000	0.0042
0.2802	0.0081	0.0009	0.0000	0.0055
0.3269	0.0081	0.0011	0.0000	0.0055
0.3736	0.0081	0.0013	0.0000	0.0055
0.4203	0.0081	0.0014	0.0000	0.0055
0.4670	0.0081	0.0016	0.0000	0.0055
0.5137	0.0081	0.0017	0.0000	0.0055
0.5604	0.0081	0.0019	0.0000	0.0055
0.6071	0.0081	0.0021	0.0000	0.0055
0.6538	0.0081	0.0022	0.0000	0.0055
0.7005	0.0081	0.0024	0.0000	0.0055
0.7473	0.0081	0.0025	0.0000	0.0055
0.7940	0.0081	0.0027	0.0000	0.0055
0.8407	0.0081	0.0028	0.0000	0.0055
0.8874	0.0081	0.0030	0.0000	0.0055
0.9341	0.0081	0.0032	0.0000	0.0055
0.9808	0.0081	0.0033	0.0000	0.0055
1.0275	0.0081	0.0035	0.0000	0.0055
1.0742	0.0081	0.0036	0.0000	0.0055
1.1209	0.0081	0.0038	0.0000	0.0055
1.1676	0.0081	0.0039	0.0000	0.0055
1.2143	0.0081	0.0041	0.0000	0.0055
1.2610	0.0081	0.0043	0.0000	0.0055

1.3077	0.0081	0.0044	0.0000	0.0055
1.3544	0.0081	0.0046	0.0000	0.0055
1.4011	0.0081	0.0047	0.0000	0.0055
1.4478	0.0081	0.0049	0.0000	0.0055
1.4945	0.0081	0.0051	0.0000	0.0055
1.5412	0.0081	0.0052	0.0000	0.0055
1.5879	0.0081	0.0054	0.0000	0.0055
1.6346	0.0081	0.0055	0.0000	0.0055
1.6813	0.0081	0.0057	0.0000	0.0055
1.7280	0.0081	0.0058	0.0000	0.0055
1.7747	0.0081	0.0060	0.0000	0.0055
1.8214	0.0081	0.0062	0.0000	0.0055
1.8681	0.0081	0.0063	0.0000	0.0055
1.9148	0.0081	0.0065	0.0000	0.0055
1.9615	0.0081	0.0066	0.0000	0.0055
2.0082	0.0081	0.0068	0.0000	0.0055
2.0549	0.0081	0.0070	0.0000	0.0055
2.1016	0.0081	0.0071	0.0000	0.0055
2.1484	0.0081	0.0073	0.0000	0.0055
2.1951	0.0081	0.0074	0.0000	0.0055
2.2418	0.0081	0.0076	0.0000	0.0055
2.2885	0.0081	0.0077	0.0000	0.0055
2.3352	0.0081	0.0079	0.0000	0.0055
2.3819	0.0081	0.0081	0.0000	0.0055
2.4286	0.0081	0.0082	0.0000	0.0055
2.4753	0.0081	0.0084	0.0000	0.0055
2.5220	0.0081	0.0085	0.0000	0.0055
2.5687	0.0081	0.0087	0.0000	0.0055
2.6154	0.0081	0.0088	0.0000	0.0055
2.6621	0.0081	0.0090	0.0000	0.0055
2.7088	0.0081	0.0092	0.0000	0.0055
2.7555	0.0081	0.0093	0.0000	0.0055
2.8022	0.0081	0.0095	0.0000	0.0055
2.8489	0.0081	0.0096	0.0000	0.0055
2.8956	0.0081	0.0098	0.0000	0.0055
2.9423	0.0081	0.0100	0.0000	0.0055
2.9890	0.0081	0.0101	0.0000	0.0055
3.0357	0.0081	0.0103	0.0000	0.0055
3.0824	0.0081	0.0104	0.0000	0.0055
3.1291	0.0081	0.0106	0.0000	0.0055
3.1758	0.0081	0.0107	0.0000	0.0055
3.2225	0.0081	0.0109	0.0000	0.0055
3.2692	0.0081	0.0111	0.0000	0.0055
3.3159	0.0081	0.0112	0.0000	0.0055
3.3626	0.0081	0.0114	0.0000	0.0055
3.4093	0.0081	0.0115	0.0000	0.0055
3.4560	0.0081	0.0117	0.0000	0.0055
3.5027	0.0081	0.0118	0.0000	0.0055
3.5495	0.0081	0.0120	0.0000	0.0055
3.5962	0.0081	0.0122	0.0000	0.0055
3.6429	0.0081	0.0123	0.0000	0.0055
3.6896	0.0081	0.0125	0.0000	0.0055
3.7363	0.0081	0.0126	0.0000	0.0055
3.7830	0.0081	0.0128	0.0000	0.0055
3.8297	0.0081	0.0130	0.0000	0.0055
3.8764	0.0081	0.0131	0.0000	0.0055
3.9231	0.0081	0.0133	0.0000	0.0055
3.9698	0.0081	0.0134	0.0000	0.0055

4.0000	0.0081	0.0135	0.0000	0.0055

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.0000	0.0081	0.0135	0.0000	4.1240	0.0000
4.0467	0.0081	0.0139	0.1070	4.1240	0.0000
4.0934	0.0081	0.0143	0.3014	4.1716	0.0000
4.1401	0.0081	0.0147	0.5479	4.2192	0.0000
4.1868	0.0081	0.0151	0.8261	4.2668	0.0000
4.2335	0.0081	0.0154	1.1162	4.3144	0.0000
4.2500	0.0081	0.0156	1.3977	4.3312	0.0000

Surface Trench 3

Element Flows To:

Outlet 1	Outlet 2
	Trench 3

Trench 4

Bottom Length:	85.00 ft.
Bottom Width:	10.00 ft.
Material thickness of first layer:	4
Material type for first layer:	GRAVEL
Material thickness of second layer:	0
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	0.67
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	9.8
Total Volume Through Riser (ac-ft.):	3.773
Total Volume Through Facility (ac-ft.):	13.573
Percent Infiltrated:	72.2
Total Precip Applied to Facility:	1.082
Total Evap From Facility:	0.342
Underdrain not used	
Discharge Structure	
Riser Height:	0 ft.
Riser Diameter:	12 in.
Element Flows To:	
Outlet 1	Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0195	0.0000	0.0000	0.0000
0.0467	0.0195	0.0004	0.0000	0.0000
0.0934	0.0195	0.0008	0.0000	0.0014
0.1401	0.0195	0.0011	0.0000	0.0032
0.1868	0.0195	0.0015	0.0000	0.0060
0.2335	0.0195	0.0019	0.0000	0.0100
0.2802	0.0195	0.0023	0.0000	0.0132
0.3269	0.0195	0.0026	0.0000	0.0132
0.3736	0.0195	0.0030	0.0000	0.0132
0.4203	0.0195	0.0034	0.0000	0.0132
0.4670	0.0195	0.0038	0.0000	0.0132
0.5137	0.0195	0.0042	0.0000	0.0132
0.5604	0.0195	0.0045	0.0000	0.0132
0.6071	0.0195	0.0049	0.0000	0.0132
0.6538	0.0195	0.0053	0.0000	0.0132
0.7005	0.0195	0.0057	0.0000	0.0132
0.7473	0.0195	0.0061	0.0000	0.0132
0.7940	0.0195	0.0064	0.0000	0.0132
0.8407	0.0195	0.0068	0.0000	0.0132
0.8874	0.0195	0.0072	0.0000	0.0132
0.9341	0.0195	0.0076	0.0000	0.0132
0.9808	0.0195	0.0079	0.0000	0.0132
1.0275	0.0195	0.0083	0.0000	0.0132
1.0742	0.0195	0.0087	0.0000	0.0132
1.1209	0.0195	0.0091	0.0000	0.0132
1.1676	0.0195	0.0095	0.0000	0.0132
1.2143	0.0195	0.0098	0.0000	0.0132
1.2610	0.0195	0.0102	0.0000	0.0132

1.3077	0.0195	0.0106	0.0000	0.0132
1.3544	0.0195	0.0110	0.0000	0.0132
1.4011	0.0195	0.0113	0.0000	0.0132
1.4478	0.0195	0.0117	0.0000	0.0132
1.4945	0.0195	0.0121	0.0000	0.0132
1.5412	0.0195	0.0125	0.0000	0.0132
1.5879	0.0195	0.0129	0.0000	0.0132
1.6346	0.0195	0.0132	0.0000	0.0132
1.6813	0.0195	0.0136	0.0000	0.0132
1.7280	0.0195	0.0140	0.0000	0.0132
1.7747	0.0195	0.0144	0.0000	0.0132
1.8214	0.0195	0.0147	0.0000	0.0132
1.8681	0.0195	0.0151	0.0000	0.0132
1.9148	0.0195	0.0155	0.0000	0.0132
1.9615	0.0195	0.0159	0.0000	0.0132
2.0082	0.0195	0.0163	0.0000	0.0132
2.0549	0.0195	0.0166	0.0000	0.0132
2.1016	0.0195	0.0170	0.0000	0.0132
2.1484	0.0195	0.0174	0.0000	0.0132
2.1951	0.0195	0.0178	0.0000	0.0132
2.2418	0.0195	0.0182	0.0000	0.0132
2.2885	0.0195	0.0185	0.0000	0.0132
2.3352	0.0195	0.0189	0.0000	0.0132
2.3819	0.0195	0.0193	0.0000	0.0132
2.4286	0.0195	0.0197	0.0000	0.0132
2.4753	0.0195	0.0200	0.0000	0.0132
2.5220	0.0195	0.0204	0.0000	0.0132
2.5687	0.0195	0.0208	0.0000	0.0132
2.6154	0.0195	0.0212	0.0000	0.0132
2.6621	0.0195	0.0216	0.0000	0.0132
2.7088	0.0195	0.0219	0.0000	0.0132
2.7555	0.0195	0.0223	0.0000	0.0132
2.8022	0.0195	0.0227	0.0000	0.0132
2.8489	0.0195	0.0231	0.0000	0.0132
2.8956	0.0195	0.0234	0.0000	0.0132
2.9423	0.0195	0.0238	0.0000	0.0132
2.9890	0.0195	0.0242	0.0000	0.0132
3.0357	0.0195	0.0246	0.0000	0.0132
3.0824	0.0195	0.0250	0.0000	0.0132
3.1291	0.0195	0.0253	0.0000	0.0132
3.1758	0.0195	0.0257	0.0000	0.0132
3.2225	0.0195	0.0261	0.0000	0.0132
3.2692	0.0195	0.0265	0.0000	0.0132
3.3159	0.0195	0.0269	0.0000	0.0132
3.3626	0.0195	0.0272	0.0000	0.0132
3.4093	0.0195	0.0276	0.0000	0.0132
3.4560	0.0195	0.0280	0.0000	0.0132
3.5027	0.0195	0.0284	0.0000	0.0132
3.5495	0.0195	0.0287	0.0000	0.0132
3.5962	0.0195	0.0291	0.0000	0.0132
3.6429	0.0195	0.0295	0.0000	0.0132
3.6896	0.0195	0.0299	0.0000	0.0132
3.7363	0.0195	0.0303	0.0000	0.0132
3.7830	0.0195	0.0306	0.0000	0.0132
3.8297	0.0195	0.0310	0.0000	0.0132
3.8764	0.0195	0.0314	0.0000	0.0132
3.9231	0.0195	0.0318	0.0000	0.0132
3.9698	0.0195	0.0321	0.0000	0.0132

4.0000	0.0195	0.0324	0.0000	0.0132

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.0000	0.0195	0.0324	0.0000	9.8745	0.0000
4.0467	0.0195	0.0333	0.1070	9.8745	0.0000
4.0934	0.0195	0.0342	0.3014	9.9884	0.0000
4.1401	0.0195	0.0351	0.5479	10.102	0.0000
4.1868	0.0195	0.0360	0.8261	10.216	0.0000
4.2335	0.0195	0.0369	1.1162	10.330	0.0000
4.2500	0.0195	0.0373	1.3977	10.371	0.0000

Surface Trench 4

Element Flows To:

Outlet 1	Outlet 2
	Trench 4

Trench 5

Bottom Length:	121.00 ft.
Bottom Width:	4.00 ft.
Material thickness of first layer:	4
Material type for first layer:	GRAVEL
Material thickness of second layer:	0
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	0.67
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	4.017
Total Volume Through Riser (ac-ft.):	2.308
Total Volume Through Facility (ac-ft.):	6.325
Percent Infiltrated:	63.51
Total Precip Applied to Facility:	0.511
Total Evap From Facility:	0.173

Underdrain not used

Discharge Structure

Riser Height:	0 ft.
Riser Diameter:	12 in.

Element Flows To:

Outlet 1 Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0111	0.0000	0.0000	0.0000
0.0467	0.0111	0.0002	0.0000	0.0000
0.0934	0.0111	0.0004	0.0000	0.0008
0.1401	0.0111	0.0006	0.0000	0.0018
0.1868	0.0111	0.0009	0.0000	0.0034
0.2335	0.0111	0.0011	0.0000	0.0057
0.2802	0.0111	0.0013	0.0000	0.0075
0.3269	0.0111	0.0015	0.0000	0.0075
0.3736	0.0111	0.0017	0.0000	0.0075
0.4203	0.0111	0.0019	0.0000	0.0075
0.4670	0.0111	0.0022	0.0000	0.0075
0.5137	0.0111	0.0024	0.0000	0.0075
0.5604	0.0111	0.0026	0.0000	0.0075
0.6071	0.0111	0.0028	0.0000	0.0075
0.6538	0.0111	0.0030	0.0000	0.0075
0.7005	0.0111	0.0032	0.0000	0.0075
0.7473	0.0111	0.0034	0.0000	0.0075
0.7940	0.0111	0.0037	0.0000	0.0075
0.8407	0.0111	0.0039	0.0000	0.0075
0.8874	0.0111	0.0041	0.0000	0.0075
0.9341	0.0111	0.0043	0.0000	0.0075
0.9808	0.0111	0.0045	0.0000	0.0075
1.0275	0.0111	0.0047	0.0000	0.0075
1.0742	0.0111	0.0050	0.0000	0.0075
1.1209	0.0111	0.0052	0.0000	0.0075
1.1676	0.0111	0.0054	0.0000	0.0075
1.2143	0.0111	0.0056	0.0000	0.0075
1.2610	0.0111	0.0058	0.0000	0.0075

1.3077	0.0111	0.0060	0.0000	0.0075
1.3544	0.0111	0.0062	0.0000	0.0075
1.4011	0.0111	0.0065	0.0000	0.0075
1.4478	0.0111	0.0067	0.0000	0.0075
1.4945	0.0111	0.0069	0.0000	0.0075
1.5412	0.0111	0.0071	0.0000	0.0075
1.5879	0.0111	0.0073	0.0000	0.0075
1.6346	0.0111	0.0075	0.0000	0.0075
1.6813	0.0111	0.0078	0.0000	0.0075
1.7280	0.0111	0.0080	0.0000	0.0075
1.7747	0.0111	0.0082	0.0000	0.0075
1.8214	0.0111	0.0084	0.0000	0.0075
1.8681	0.0111	0.0086	0.0000	0.0075
1.9148	0.0111	0.0088	0.0000	0.0075
1.9615	0.0111	0.0090	0.0000	0.0075
2.0082	0.0111	0.0093	0.0000	0.0075
2.0549	0.0111	0.0095	0.0000	0.0075
2.1016	0.0111	0.0097	0.0000	0.0075
2.1484	0.0111	0.0099	0.0000	0.0075
2.1951	0.0111	0.0101	0.0000	0.0075
2.2418	0.0111	0.0103	0.0000	0.0075
2.2885	0.0111	0.0106	0.0000	0.0075
2.3352	0.0111	0.0108	0.0000	0.0075
2.3819	0.0111	0.0110	0.0000	0.0075
2.4286	0.0111	0.0112	0.0000	0.0075
2.4753	0.0111	0.0114	0.0000	0.0075
2.5220	0.0111	0.0116	0.0000	0.0075
2.5687	0.0111	0.0118	0.0000	0.0075
2.6154	0.0111	0.0121	0.0000	0.0075
2.6621	0.0111	0.0123	0.0000	0.0075
2.7088	0.0111	0.0125	0.0000	0.0075
2.7555	0.0111	0.0127	0.0000	0.0075
2.8022	0.0111	0.0129	0.0000	0.0075
2.8489	0.0111	0.0131	0.0000	0.0075
2.8956	0.0111	0.0134	0.0000	0.0075
2.9423	0.0111	0.0136	0.0000	0.0075
2.9890	0.0111	0.0138	0.0000	0.0075
3.0357	0.0111	0.0140	0.0000	0.0075
3.0824	0.0111	0.0142	0.0000	0.0075
3.1291	0.0111	0.0144	0.0000	0.0075
3.1758	0.0111	0.0146	0.0000	0.0075
3.2225	0.0111	0.0149	0.0000	0.0075
3.2692	0.0111	0.0151	0.0000	0.0075
3.3159	0.0111	0.0153	0.0000	0.0075
3.3626	0.0111	0.0155	0.0000	0.0075
3.4093	0.0111	0.0157	0.0000	0.0075
3.4560	0.0111	0.0159	0.0000	0.0075
3.5027	0.0111	0.0162	0.0000	0.0075
3.5495	0.0111	0.0164	0.0000	0.0075
3.5962	0.0111	0.0166	0.0000	0.0075
3.6429	0.0111	0.0168	0.0000	0.0075
3.6896	0.0111	0.0170	0.0000	0.0075
3.7363	0.0111	0.0172	0.0000	0.0075
3.7830	0.0111	0.0174	0.0000	0.0075
3.8297	0.0111	0.0177	0.0000	0.0075
3.8764	0.0111	0.0179	0.0000	0.0075
3.9231	0.0111	0.0181	0.0000	0.0075
3.9698	0.0111	0.0183	0.0000	0.0075

4.0000	0.0111	0.0184	0.0000	0.0075

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.0000	0.0111	0.0184	0.0000	5.6226	0.0000
4.0467	0.0111	0.0190	0.1070	5.6226	0.0000
4.0934	0.0111	0.0195	0.3014	5.6875	0.0000
4.1401	0.0111	0.0200	0.5479	5.7524	0.0000
4.1868	0.0111	0.0205	0.8261	5.8173	0.0000
4.2335	0.0111	0.0210	1.1162	5.8822	0.0000
4.2500	0.0111	0.0212	1.3977	5.9051	0.0000

Surface Trench 5

Element Flows To:

Outlet 1	Outlet 2
	Trench 5

Trench 6

Bottom Length:	35.00 ft.
Bottom Width:	10.00 ft.
Material thickness of first layer:	4
Material type for first layer:	GRAVEL
Material thickness of second layer:	0
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	0.67
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	4.956
Total Volume Through Riser (ac-ft.):	2.507
Total Volume Through Facility (ac-ft.):	7.463
Percent Infiltrated:	66.41
Total Precip Applied to Facility:	0.443
Total Evap From Facility:	0.142
Underdrain not used	
Discharge Structure	
Riser Height:	0 ft.
Riser Diameter:	6 in.
Element Flows To:	
Outlet 1	Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0080	0.0000	0.0000	0.0000
0.0467	0.0080	0.0002	0.0000	0.0000
0.0934	0.0080	0.0003	0.0000	0.0006
0.1401	0.0080	0.0005	0.0000	0.0013
0.1868	0.0080	0.0006	0.0000	0.0025
0.2335	0.0080	0.0008	0.0000	0.0041
0.2802	0.0080	0.0009	0.0000	0.0054
0.3269	0.0080	0.0011	0.0000	0.0054
0.3736	0.0080	0.0012	0.0000	0.0054
0.4203	0.0080	0.0014	0.0000	0.0054
0.4670	0.0080	0.0016	0.0000	0.0054
0.5137	0.0080	0.0017	0.0000	0.0054
0.5604	0.0080	0.0019	0.0000	0.0054
0.6071	0.0080	0.0020	0.0000	0.0054
0.6538	0.0080	0.0022	0.0000	0.0054
0.7005	0.0080	0.0023	0.0000	0.0054
0.7473	0.0080	0.0025	0.0000	0.0054
0.7940	0.0080	0.0026	0.0000	0.0054
0.8407	0.0080	0.0028	0.0000	0.0054
0.8874	0.0080	0.0030	0.0000	0.0054
0.9341	0.0080	0.0031	0.0000	0.0054
0.9808	0.0080	0.0033	0.0000	0.0054
1.0275	0.0080	0.0034	0.0000	0.0054
1.0742	0.0080	0.0036	0.0000	0.0054
1.1209	0.0080	0.0037	0.0000	0.0054
1.1676	0.0080	0.0039	0.0000	0.0054
1.2143	0.0080	0.0040	0.0000	0.0054
1.2610	0.0080	0.0042	0.0000	0.0054

1.3077	0.0080	0.0044	0.0000	0.0054
1.3544	0.0080	0.0045	0.0000	0.0054
1.4011	0.0080	0.0047	0.0000	0.0054
1.4478	0.0080	0.0048	0.0000	0.0054
1.4945	0.0080	0.0050	0.0000	0.0054
1.5412	0.0080	0.0051	0.0000	0.0054
1.5879	0.0080	0.0053	0.0000	0.0054
1.6346	0.0080	0.0055	0.0000	0.0054
1.6813	0.0080	0.0056	0.0000	0.0054
1.7280	0.0080	0.0058	0.0000	0.0054
1.7747	0.0080	0.0059	0.0000	0.0054
1.8214	0.0080	0.0061	0.0000	0.0054
1.8681	0.0080	0.0062	0.0000	0.0054
1.9148	0.0080	0.0064	0.0000	0.0054
1.9615	0.0080	0.0065	0.0000	0.0054
2.0082	0.0080	0.0067	0.0000	0.0054
2.0549	0.0080	0.0069	0.0000	0.0054
2.1016	0.0080	0.0070	0.0000	0.0054
2.1484	0.0080	0.0072	0.0000	0.0054
2.1951	0.0080	0.0073	0.0000	0.0054
2.2418	0.0080	0.0075	0.0000	0.0054
2.2885	0.0080	0.0076	0.0000	0.0054
2.3352	0.0080	0.0078	0.0000	0.0054
2.3819	0.0080	0.0079	0.0000	0.0054
2.4286	0.0080	0.0081	0.0000	0.0054
2.4753	0.0080	0.0083	0.0000	0.0054
2.5220	0.0080	0.0084	0.0000	0.0054
2.5687	0.0080	0.0086	0.0000	0.0054
2.6154	0.0080	0.0087	0.0000	0.0054
2.6621	0.0080	0.0089	0.0000	0.0054
2.7088	0.0080	0.0090	0.0000	0.0054
2.7555	0.0080	0.0092	0.0000	0.0054
2.8022	0.0080	0.0093	0.0000	0.0054
2.8489	0.0080	0.0095	0.0000	0.0054
2.8956	0.0080	0.0097	0.0000	0.0054
2.9423	0.0080	0.0098	0.0000	0.0054
2.9890	0.0080	0.0100	0.0000	0.0054
3.0357	0.0080	0.0101	0.0000	0.0054
3.0824	0.0080	0.0103	0.0000	0.0054
3.1291	0.0080	0.0104	0.0000	0.0054
3.1758	0.0080	0.0106	0.0000	0.0054
3.2225	0.0080	0.0107	0.0000	0.0054
3.2692	0.0080	0.0109	0.0000	0.0054
3.3159	0.0080	0.0111	0.0000	0.0054
3.3626	0.0080	0.0112	0.0000	0.0054
3.4093	0.0080	0.0114	0.0000	0.0054
3.4560	0.0080	0.0115	0.0000	0.0054
3.5027	0.0080	0.0117	0.0000	0.0054
3.5495	0.0080	0.0118	0.0000	0.0054
3.5962	0.0080	0.0120	0.0000	0.0054
3.6429	0.0080	0.0121	0.0000	0.0054
3.6896	0.0080	0.0123	0.0000	0.0054
3.7363	0.0080	0.0125	0.0000	0.0054
3.7830	0.0080	0.0126	0.0000	0.0054
3.8297	0.0080	0.0128	0.0000	0.0054
3.8764	0.0080	0.0129	0.0000	0.0054
3.9231	0.0080	0.0131	0.0000	0.0054
3.9698	0.0080	0.0132	0.0000	0.0054

4.0000	0.0080	0.0133	0.0000	0.0054

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.0000	0.0080	0.0133	0.0000	4.0660	0.0000
4.0467	0.0080	0.0137	0.0533	4.0660	0.0000
4.0934	0.0080	0.0141	0.1460	4.1129	0.0000
4.1401	0.0080	0.0145	0.2471	4.1598	0.0000
4.1868	0.0080	0.0148	0.3293	4.2067	0.0000
4.2335	0.0080	0.0152	0.3781	4.2537	0.0000
4.2500	0.0080	0.0153	0.4168	4.2702	0.0000

Surface Trench 6

Element Flows To:

Outlet 1	Outlet 2
	Trench 6

Trench 7

Bottom Length:	53.00 ft.
Bottom Width:	10.00 ft.
Material thickness of first layer:	4
Material type for first layer:	GRAVEL
Material thickness of second layer:	0
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	0.67
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	6.965
Total Volume Through Riser (ac-ft.):	4.65
Total Volume Through Facility (ac-ft.):	11.615
Percent Infiltrated:	59.97
Total Precip Applied to Facility:	0.677
Total Evap From Facility:	0.22
Underdrain not used	
Discharge Structure	
Riser Height:	0 ft.
Riser Diameter:	12 in.
Element Flows To:	
Outlet 1	Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0122	0.0000	0.0000	0.0000
0.0467	0.0122	0.0002	0.0000	0.0000
0.0934	0.0122	0.0005	0.0000	0.0008
0.1401	0.0122	0.0007	0.0000	0.0020
0.1868	0.0122	0.0009	0.0000	0.0038
0.2335	0.0122	0.0012	0.0000	0.0062
0.2802	0.0122	0.0014	0.0000	0.0082
0.3269	0.0122	0.0017	0.0000	0.0082
0.3736	0.0122	0.0019	0.0000	0.0082
0.4203	0.0122	0.0021	0.0000	0.0082
0.4670	0.0122	0.0024	0.0000	0.0082
0.5137	0.0122	0.0026	0.0000	0.0082
0.5604	0.0122	0.0028	0.0000	0.0082
0.6071	0.0122	0.0031	0.0000	0.0082
0.6538	0.0122	0.0033	0.0000	0.0082
0.7005	0.0122	0.0035	0.0000	0.0082
0.7473	0.0122	0.0038	0.0000	0.0082
0.7940	0.0122	0.0040	0.0000	0.0082
0.8407	0.0122	0.0042	0.0000	0.0082
0.8874	0.0122	0.0045	0.0000	0.0082
0.9341	0.0122	0.0047	0.0000	0.0082
0.9808	0.0122	0.0050	0.0000	0.0082
1.0275	0.0122	0.0052	0.0000	0.0082
1.0742	0.0122	0.0054	0.0000	0.0082
1.1209	0.0122	0.0057	0.0000	0.0082
1.1676	0.0122	0.0059	0.0000	0.0082
1.2143	0.0122	0.0061	0.0000	0.0082
1.2610	0.0122	0.0064	0.0000	0.0082

1.3077	0.0122	0.0066	0.0000	0.0082
1.3544	0.0122	0.0068	0.0000	0.0082
1.4011	0.0122	0.0071	0.0000	0.0082
1.4478	0.0122	0.0073	0.0000	0.0082
1.4945	0.0122	0.0075	0.0000	0.0082
1.5412	0.0122	0.0078	0.0000	0.0082
1.5879	0.0122	0.0080	0.0000	0.0082
1.6346	0.0122	0.0083	0.0000	0.0082
1.6813	0.0122	0.0085	0.0000	0.0082
1.7280	0.0122	0.0087	0.0000	0.0082
1.7747	0.0122	0.0090	0.0000	0.0082
1.8214	0.0122	0.0092	0.0000	0.0082
1.8681	0.0122	0.0094	0.0000	0.0082
1.9148	0.0122	0.0097	0.0000	0.0082
1.9615	0.0122	0.0099	0.0000	0.0082
2.0082	0.0122	0.0101	0.0000	0.0082
2.0549	0.0122	0.0104	0.0000	0.0082
2.1016	0.0122	0.0106	0.0000	0.0082
2.1484	0.0122	0.0108	0.0000	0.0082
2.1951	0.0122	0.0111	0.0000	0.0082
2.2418	0.0122	0.0113	0.0000	0.0082
2.2885	0.0122	0.0116	0.0000	0.0082
2.3352	0.0122	0.0118	0.0000	0.0082
2.3819	0.0122	0.0120	0.0000	0.0082
2.4286	0.0122	0.0123	0.0000	0.0082
2.4753	0.0122	0.0125	0.0000	0.0082
2.5220	0.0122	0.0127	0.0000	0.0082
2.5687	0.0122	0.0130	0.0000	0.0082
2.6154	0.0122	0.0132	0.0000	0.0082
2.6621	0.0122	0.0134	0.0000	0.0082
2.7088	0.0122	0.0137	0.0000	0.0082
2.7555	0.0122	0.0139	0.0000	0.0082
2.8022	0.0122	0.0141	0.0000	0.0082
2.8489	0.0122	0.0144	0.0000	0.0082
2.8956	0.0122	0.0146	0.0000	0.0082
2.9423	0.0122	0.0149	0.0000	0.0082
2.9890	0.0122	0.0151	0.0000	0.0082
3.0357	0.0122	0.0153	0.0000	0.0082
3.0824	0.0122	0.0156	0.0000	0.0082
3.1291	0.0122	0.0158	0.0000	0.0082
3.1758	0.0122	0.0160	0.0000	0.0082
3.2225	0.0122	0.0163	0.0000	0.0082
3.2692	0.0122	0.0165	0.0000	0.0082
3.3159	0.0122	0.0167	0.0000	0.0082
3.3626	0.0122	0.0170	0.0000	0.0082
3.4093	0.0122	0.0172	0.0000	0.0082
3.4560	0.0122	0.0175	0.0000	0.0082
3.5027	0.0122	0.0177	0.0000	0.0082
3.5495	0.0122	0.0179	0.0000	0.0082
3.5962	0.0122	0.0182	0.0000	0.0082
3.6429	0.0122	0.0184	0.0000	0.0082
3.6896	0.0122	0.0186	0.0000	0.0082
3.7363	0.0122	0.0189	0.0000	0.0082
3.7830	0.0122	0.0191	0.0000	0.0082
3.8297	0.0122	0.0193	0.0000	0.0082
3.8764	0.0122	0.0196	0.0000	0.0082
3.9231	0.0122	0.0198	0.0000	0.0082
3.9698	0.0122	0.0200	0.0000	0.0082

4.0000	0.0122	0.0202	0.0000	0.0082

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.0000	0.0122	0.0202	0.0000	6.1570	0.0000
4.0467	0.0122	0.0208	0.1070	6.1570	0.0000
4.0934	0.0122	0.0213	0.3014	6.2281	0.0000
4.1401	0.0122	0.0219	0.5479	6.2991	0.0000
4.1868	0.0122	0.0225	0.8261	6.3702	0.0000
4.2335	0.0122	0.0230	1.1162	6.4413	0.0000
4.2500	0.0122	0.0232	1.3977	6.4663	0.0000

Surface Trench 7

Element Flows To:

Outlet 1	Outlet 2
	Trench 7

Trench 8

Bottom Length:	74.00 ft.
Bottom Width:	5.00 ft.
Material thickness of first layer:	4
Material type for first layer:	GRAVEL
Material thickness of second layer:	0
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	0.67
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	3.037
Total Volume Through Riser (ac-ft.):	2.274
Total Volume Through Facility (ac-ft.):	5.311
Percent Infiltrated:	57.18
Total Precip Applied to Facility:	0.39
Total Evap From Facility:	0.133
Underdrain not used	
Discharge Structure	
Riser Height:	0 ft.
Riser Diameter:	12 in.
Element Flows To:	
Outlet 1	Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0085	0.0000	0.0000	0.0000
0.0467	0.0085	0.0002	0.0000	0.0000
0.0934	0.0085	0.0003	0.0000	0.0006
0.1401	0.0085	0.0005	0.0000	0.0014
0.1868	0.0085	0.0007	0.0000	0.0026
0.2335	0.0085	0.0008	0.0000	0.0043
0.2802	0.0085	0.0010	0.0000	0.0057
0.3269	0.0085	0.0012	0.0000	0.0057
0.3736	0.0085	0.0013	0.0000	0.0057
0.4203	0.0085	0.0015	0.0000	0.0057
0.4670	0.0085	0.0016	0.0000	0.0057
0.5137	0.0085	0.0018	0.0000	0.0057
0.5604	0.0085	0.0020	0.0000	0.0057
0.6071	0.0085	0.0021	0.0000	0.0057
0.6538	0.0085	0.0023	0.0000	0.0057
0.7005	0.0085	0.0025	0.0000	0.0057
0.7473	0.0085	0.0026	0.0000	0.0057
0.7940	0.0085	0.0028	0.0000	0.0057
0.8407	0.0085	0.0030	0.0000	0.0057
0.8874	0.0085	0.0031	0.0000	0.0057
0.9341	0.0085	0.0033	0.0000	0.0057
0.9808	0.0085	0.0035	0.0000	0.0057
1.0275	0.0085	0.0036	0.0000	0.0057
1.0742	0.0085	0.0038	0.0000	0.0057
1.1209	0.0085	0.0040	0.0000	0.0057
1.1676	0.0085	0.0041	0.0000	0.0057
1.2143	0.0085	0.0043	0.0000	0.0057
1.2610	0.0085	0.0044	0.0000	0.0057

1.3077	0.0085	0.0046	0.0000	0.0057
1.3544	0.0085	0.0048	0.0000	0.0057
1.4011	0.0085	0.0049	0.0000	0.0057
1.4478	0.0085	0.0051	0.0000	0.0057
1.4945	0.0085	0.0053	0.0000	0.0057
1.5412	0.0085	0.0054	0.0000	0.0057
1.5879	0.0085	0.0056	0.0000	0.0057
1.6346	0.0085	0.0058	0.0000	0.0057
1.6813	0.0085	0.0059	0.0000	0.0057
1.7280	0.0085	0.0061	0.0000	0.0057
1.7747	0.0085	0.0063	0.0000	0.0057
1.8214	0.0085	0.0064	0.0000	0.0057
1.8681	0.0085	0.0066	0.0000	0.0057
1.9148	0.0085	0.0067	0.0000	0.0057
1.9615	0.0085	0.0069	0.0000	0.0057
2.0082	0.0085	0.0071	0.0000	0.0057
2.0549	0.0085	0.0072	0.0000	0.0057
2.1016	0.0085	0.0074	0.0000	0.0057
2.1484	0.0085	0.0076	0.0000	0.0057
2.1951	0.0085	0.0077	0.0000	0.0057
2.2418	0.0085	0.0079	0.0000	0.0057
2.2885	0.0085	0.0081	0.0000	0.0057
2.3352	0.0085	0.0082	0.0000	0.0057
2.3819	0.0085	0.0084	0.0000	0.0057
2.4286	0.0085	0.0086	0.0000	0.0057
2.4753	0.0085	0.0087	0.0000	0.0057
2.5220	0.0085	0.0089	0.0000	0.0057
2.5687	0.0085	0.0091	0.0000	0.0057
2.6154	0.0085	0.0092	0.0000	0.0057
2.6621	0.0085	0.0094	0.0000	0.0057
2.7088	0.0085	0.0095	0.0000	0.0057
2.7555	0.0085	0.0097	0.0000	0.0057
2.8022	0.0085	0.0099	0.0000	0.0057
2.8489	0.0085	0.0100	0.0000	0.0057
2.8956	0.0085	0.0102	0.0000	0.0057
2.9423	0.0085	0.0104	0.0000	0.0057
2.9890	0.0085	0.0105	0.0000	0.0057
3.0357	0.0085	0.0107	0.0000	0.0057
3.0824	0.0085	0.0109	0.0000	0.0057
3.1291	0.0085	0.0110	0.0000	0.0057
3.1758	0.0085	0.0112	0.0000	0.0057
3.2225	0.0085	0.0114	0.0000	0.0057
3.2692	0.0085	0.0115	0.0000	0.0057
3.3159	0.0085	0.0117	0.0000	0.0057
3.3626	0.0085	0.0119	0.0000	0.0057
3.4093	0.0085	0.0120	0.0000	0.0057
3.4560	0.0085	0.0122	0.0000	0.0057
3.5027	0.0085	0.0123	0.0000	0.0057
3.5495	0.0085	0.0125	0.0000	0.0057
3.5962	0.0085	0.0127	0.0000	0.0057
3.6429	0.0085	0.0128	0.0000	0.0057
3.6896	0.0085	0.0130	0.0000	0.0057
3.7363	0.0085	0.0132	0.0000	0.0057
3.7830	0.0085	0.0133	0.0000	0.0057
3.8297	0.0085	0.0135	0.0000	0.0057
3.8764	0.0085	0.0137	0.0000	0.0057
3.9231	0.0085	0.0138	0.0000	0.0057
3.9698	0.0085	0.0140	0.0000	0.0057

4.0000	0.0085	0.0141	0.0000	0.0057

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.0000	0.0085	0.0141	0.0000	4.2983	0.0000
4.0467	0.0085	0.0145	0.1070	4.2983	0.0000
4.0934	0.0085	0.0149	0.3014	4.3479	0.0000
4.1401	0.0085	0.0153	0.5479	4.3975	0.0000
4.1868	0.0085	0.0157	0.8261	4.4471	0.0000
4.2335	0.0085	0.0161	1.1162	4.4967	0.0000
4.2500	0.0085	0.0162	1.3977	4.5142	0.0000

Surface Trench 8

Element Flows To:

Outlet 1	Outlet 2
	Trench 8

Trench 9

Bottom Length:	166.00 ft.
Bottom Width:	5.00 ft.
Material thickness of first layer:	4
Material type for first layer:	GRAVEL
Material thickness of second layer:	0
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	0.67
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	10.647
Total Volume Through Riser (ac-ft.):	4.3
Total Volume Through Facility (ac-ft.):	14.947
Percent Infiltrated:	71.23
Total Precip Applied to Facility:	1.052
Total Evap From Facility:	0.335
Underdrain not used	
Discharge Structure	
Riser Height:	0 ft.
Riser Diameter:	12 in.
Element Flows To:	
Outlet 1	Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0191	0.0000	0.0000	0.0000
0.0467	0.0191	0.0004	0.0000	0.0000
0.0934	0.0191	0.0007	0.0000	0.0013
0.1401	0.0191	0.0011	0.0000	0.0031
0.1868	0.0191	0.0015	0.0000	0.0059
0.2335	0.0191	0.0018	0.0000	0.0097
0.2802	0.0191	0.0022	0.0000	0.0129
0.3269	0.0191	0.0026	0.0000	0.0129
0.3736	0.0191	0.0030	0.0000	0.0129
0.4203	0.0191	0.0033	0.0000	0.0129
0.4670	0.0191	0.0037	0.0000	0.0129
0.5137	0.0191	0.0041	0.0000	0.0129
0.5604	0.0191	0.0044	0.0000	0.0129
0.6071	0.0191	0.0048	0.0000	0.0129
0.6538	0.0191	0.0052	0.0000	0.0129
0.7005	0.0191	0.0055	0.0000	0.0129
0.7473	0.0191	0.0059	0.0000	0.0129
0.7940	0.0191	0.0063	0.0000	0.0129
0.8407	0.0191	0.0066	0.0000	0.0129
0.8874	0.0191	0.0070	0.0000	0.0129
0.9341	0.0191	0.0074	0.0000	0.0129
0.9808	0.0191	0.0078	0.0000	0.0129
1.0275	0.0191	0.0081	0.0000	0.0129
1.0742	0.0191	0.0085	0.0000	0.0129
1.1209	0.0191	0.0089	0.0000	0.0129
1.1676	0.0191	0.0092	0.0000	0.0129
1.2143	0.0191	0.0096	0.0000	0.0129
1.2610	0.0191	0.0100	0.0000	0.0129

1.3077	0.0191	0.0103	0.0000	0.0129
1.3544	0.0191	0.0107	0.0000	0.0129
1.4011	0.0191	0.0111	0.0000	0.0129
1.4478	0.0191	0.0114	0.0000	0.0129
1.4945	0.0191	0.0118	0.0000	0.0129
1.5412	0.0191	0.0122	0.0000	0.0129
1.5879	0.0191	0.0126	0.0000	0.0129
1.6346	0.0191	0.0129	0.0000	0.0129
1.6813	0.0191	0.0133	0.0000	0.0129
1.7280	0.0191	0.0137	0.0000	0.0129
1.7747	0.0191	0.0140	0.0000	0.0129
1.8214	0.0191	0.0144	0.0000	0.0129
1.8681	0.0191	0.0148	0.0000	0.0129
1.9148	0.0191	0.0151	0.0000	0.0129
1.9615	0.0191	0.0155	0.0000	0.0129
2.0082	0.0191	0.0159	0.0000	0.0129
2.0549	0.0191	0.0162	0.0000	0.0129
2.1016	0.0191	0.0166	0.0000	0.0129
2.1484	0.0191	0.0170	0.0000	0.0129
2.1951	0.0191	0.0174	0.0000	0.0129
2.2418	0.0191	0.0177	0.0000	0.0129
2.2885	0.0191	0.0181	0.0000	0.0129
2.3352	0.0191	0.0185	0.0000	0.0129
2.3819	0.0191	0.0188	0.0000	0.0129
2.4286	0.0191	0.0192	0.0000	0.0129
2.4753	0.0191	0.0196	0.0000	0.0129
2.5220	0.0191	0.0199	0.0000	0.0129
2.5687	0.0191	0.0203	0.0000	0.0129
2.6154	0.0191	0.0207	0.0000	0.0129
2.6621	0.0191	0.0211	0.0000	0.0129
2.7088	0.0191	0.0214	0.0000	0.0129
2.7555	0.0191	0.0218	0.0000	0.0129
2.8022	0.0191	0.0222	0.0000	0.0129
2.8489	0.0191	0.0225	0.0000	0.0129
2.8956	0.0191	0.0229	0.0000	0.0129
2.9423	0.0191	0.0233	0.0000	0.0129
2.9890	0.0191	0.0236	0.0000	0.0129
3.0357	0.0191	0.0240	0.0000	0.0129
3.0824	0.0191	0.0244	0.0000	0.0129
3.1291	0.0191	0.0247	0.0000	0.0129
3.1758	0.0191	0.0251	0.0000	0.0129
3.2225	0.0191	0.0255	0.0000	0.0129
3.2692	0.0191	0.0259	0.0000	0.0129
3.3159	0.0191	0.0262	0.0000	0.0129
3.3626	0.0191	0.0266	0.0000	0.0129
3.4093	0.0191	0.0270	0.0000	0.0129
3.4560	0.0191	0.0273	0.0000	0.0129
3.5027	0.0191	0.0277	0.0000	0.0129
3.5495	0.0191	0.0281	0.0000	0.0129
3.5962	0.0191	0.0284	0.0000	0.0129
3.6429	0.0191	0.0288	0.0000	0.0129
3.6896	0.0191	0.0292	0.0000	0.0129
3.7363	0.0191	0.0295	0.0000	0.0129
3.7830	0.0191	0.0299	0.0000	0.0129
3.8297	0.0191	0.0303	0.0000	0.0129
3.8764	0.0191	0.0307	0.0000	0.0129
3.9231	0.0191	0.0310	0.0000	0.0129
3.9698	0.0191	0.0314	0.0000	0.0129

4.0000	0.0191	0.0316	0.0000	0.0129

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.0000	0.0191	0.0316	0.0000	9.6421	0.0000
4.0467	0.0191	0.0325	0.1070	9.6421	0.0000
4.0934	0.0191	0.0334	0.3014	9.7534	0.0000
4.1401	0.0191	0.0343	0.5479	9.8647	0.0000
4.1868	0.0191	0.0352	0.8261	9.9760	0.0000
4.2335	0.0191	0.0361	1.1162	10.087	0.0000
4.2500	0.0191	0.0364	1.3977	10.127	0.0000

Surface Trench 9

Element Flows To:

Outlet 1	Outlet 2
	Trench 9

Trench 10

Bottom Length:	277.00 ft.
Bottom Width:	5.00 ft.
Material thickness of first layer:	4
Material type for first layer:	GRAVEL
Material thickness of second layer:	0
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	0.67
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	25.479
Total Volume Through Riser (ac-ft.):	4.146
Total Volume Through Facility (ac-ft.):	29.625
Percent Infiltrated:	86.01
Total Precip Applied to Facility:	1.471
Total Evap From Facility:	0.515
Underdrain not used	
Discharge Structure	
Riser Height:	0 ft.
Riser Diameter:	6 in.
Element Flows To:	
Outlet 1	Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0318	0.0000	0.0000	0.0000
0.0467	0.0318	0.0006	0.0000	0.0000
0.0934	0.0318	0.0012	0.0000	0.0022
0.1401	0.0318	0.0018	0.0000	0.0052
0.1868	0.0318	0.0025	0.0000	0.0098
0.2335	0.0318	0.0031	0.0000	0.0162
0.2802	0.0318	0.0037	0.0000	0.0215
0.3269	0.0318	0.0043	0.0000	0.0215
0.3736	0.0318	0.0049	0.0000	0.0215
0.4203	0.0318	0.0055	0.0000	0.0215
0.4670	0.0318	0.0062	0.0000	0.0215
0.5137	0.0318	0.0068	0.0000	0.0215
0.5604	0.0318	0.0074	0.0000	0.0215
0.6071	0.0318	0.0080	0.0000	0.0215
0.6538	0.0318	0.0086	0.0000	0.0215
0.7005	0.0318	0.0092	0.0000	0.0215
0.7473	0.0318	0.0099	0.0000	0.0215
0.7940	0.0318	0.0105	0.0000	0.0215
0.8407	0.0318	0.0111	0.0000	0.0215
0.8874	0.0318	0.0117	0.0000	0.0215
0.9341	0.0318	0.0123	0.0000	0.0215
0.9808	0.0318	0.0129	0.0000	0.0215
1.0275	0.0318	0.0136	0.0000	0.0215
1.0742	0.0318	0.0142	0.0000	0.0215
1.1209	0.0318	0.0148	0.0000	0.0215
1.1676	0.0318	0.0154	0.0000	0.0215
1.2143	0.0318	0.0160	0.0000	0.0215
1.2610	0.0318	0.0166	0.0000	0.0215

1.3077	0.0318	0.0173	0.0000	0.0215
1.3544	0.0318	0.0179	0.0000	0.0215
1.4011	0.0318	0.0185	0.0000	0.0215
1.4478	0.0318	0.0191	0.0000	0.0215
1.4945	0.0318	0.0197	0.0000	0.0215
1.5412	0.0318	0.0203	0.0000	0.0215
1.5879	0.0318	0.0210	0.0000	0.0215
1.6346	0.0318	0.0216	0.0000	0.0215
1.6813	0.0318	0.0222	0.0000	0.0215
1.7280	0.0318	0.0228	0.0000	0.0215
1.7747	0.0318	0.0234	0.0000	0.0215
1.8214	0.0318	0.0240	0.0000	0.0215
1.8681	0.0318	0.0247	0.0000	0.0215
1.9148	0.0318	0.0253	0.0000	0.0215
1.9615	0.0318	0.0259	0.0000	0.0215
2.0082	0.0318	0.0265	0.0000	0.0215
2.0549	0.0318	0.0271	0.0000	0.0215
2.1016	0.0318	0.0277	0.0000	0.0215
2.1484	0.0318	0.0283	0.0000	0.0215
2.1951	0.0318	0.0290	0.0000	0.0215
2.2418	0.0318	0.0296	0.0000	0.0215
2.2885	0.0318	0.0302	0.0000	0.0215
2.3352	0.0318	0.0308	0.0000	0.0215
2.3819	0.0318	0.0314	0.0000	0.0215
2.4286	0.0318	0.0320	0.0000	0.0215
2.4753	0.0318	0.0327	0.0000	0.0215
2.5220	0.0318	0.0333	0.0000	0.0215
2.5687	0.0318	0.0339	0.0000	0.0215
2.6154	0.0318	0.0345	0.0000	0.0215
2.6621	0.0318	0.0351	0.0000	0.0215
2.7088	0.0318	0.0357	0.0000	0.0215
2.7555	0.0318	0.0364	0.0000	0.0215
2.8022	0.0318	0.0370	0.0000	0.0215
2.8489	0.0318	0.0376	0.0000	0.0215
2.8956	0.0318	0.0382	0.0000	0.0215
2.9423	0.0318	0.0388	0.0000	0.0215
2.9890	0.0318	0.0394	0.0000	0.0215
3.0357	0.0318	0.0401	0.0000	0.0215
3.0824	0.0318	0.0407	0.0000	0.0215
3.1291	0.0318	0.0413	0.0000	0.0215
3.1758	0.0318	0.0419	0.0000	0.0215
3.2225	0.0318	0.0425	0.0000	0.0215
3.2692	0.0318	0.0431	0.0000	0.0215
3.3159	0.0318	0.0438	0.0000	0.0215
3.3626	0.0318	0.0444	0.0000	0.0215
3.4093	0.0318	0.0450	0.0000	0.0215
3.4560	0.0318	0.0456	0.0000	0.0215
3.5027	0.0318	0.0462	0.0000	0.0215
3.5495	0.0318	0.0468	0.0000	0.0215
3.5962	0.0318	0.0475	0.0000	0.0215
3.6429	0.0318	0.0481	0.0000	0.0215
3.6896	0.0318	0.0487	0.0000	0.0215
3.7363	0.0318	0.0493	0.0000	0.0215
3.7830	0.0318	0.0499	0.0000	0.0215
3.8297	0.0318	0.0505	0.0000	0.0215
3.8764	0.0318	0.0511	0.0000	0.0215
3.9231	0.0318	0.0518	0.0000	0.0215
3.9698	0.0318	0.0524	0.0000	0.0215

4.0000	0.0318	0.0528	0.0000	0.0215

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.0000	0.0318	0.0528	0.0000	16.090	0.0000
4.0467	0.0318	0.0543	0.0533	16.090	0.0000
4.0934	0.0318	0.0557	0.1460	16.275	0.0000
4.1401	0.0318	0.0572	0.2471	16.461	0.0000
4.1868	0.0318	0.0587	0.3293	16.647	0.0000
4.2335	0.0318	0.0602	0.3781	16.832	0.0000
4.2500	0.0318	0.0607	0.4168	16.898	0.0000

Surface Trench 10

Element Flows To:

Outlet 1	Outlet 2
	Trench 10

Trench 11

Bottom Length:	460.00 ft.
Bottom Width:	3.00 ft.
Material thickness of first layer:	13
Material type for first layer:	GRAVEL
Material thickness of second layer:	0
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	0.67
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	50.764
Total Volume Through Riser (ac-ft.):	42.334
Total Volume Through Facility (ac-ft.):	93.098
Percent Infiltrated:	54.53
Total Precip Applied to Facility:	1.728
Total Evap From Facility:	0.666
Underdrain not used	
Discharge Structure	
Riser Height:	0 ft.
Riser Diameter:	12 in.
Element Flows To:	
Outlet 1	Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0317	0.0000	0.0000	0.0000
0.1484	0.0317	0.0020	0.0000	0.0003
0.2967	0.0317	0.0039	0.0000	0.0015
0.4451	0.0317	0.0059	0.0000	0.0039
0.5934	0.0317	0.0078	0.0000	0.0077
0.7418	0.0317	0.0098	0.0000	0.0133
0.8901	0.0317	0.0117	0.0000	0.0206
1.0385	0.0317	0.0137	0.0000	0.0214
1.1868	0.0317	0.0156	0.0000	0.0214
1.3352	0.0317	0.0176	0.0000	0.0214
1.4835	0.0317	0.0195	0.0000	0.0214
1.6319	0.0317	0.0215	0.0000	0.0214
1.7802	0.0317	0.0234	0.0000	0.0214
1.9286	0.0317	0.0254	0.0000	0.0214
2.0769	0.0317	0.0273	0.0000	0.0214
2.2253	0.0317	0.0293	0.0000	0.0214
2.3736	0.0317	0.0312	0.0000	0.0214
2.5220	0.0317	0.0332	0.0000	0.0214
2.6703	0.0317	0.0351	0.0000	0.0214
2.8187	0.0317	0.0371	0.0000	0.0214
2.9670	0.0317	0.0390	0.0000	0.0214
3.1154	0.0317	0.0410	0.0000	0.0214
3.2637	0.0317	0.0429	0.0000	0.0214
3.4121	0.0317	0.0449	0.0000	0.0214
3.5604	0.0317	0.0468	0.0000	0.0214
3.7088	0.0317	0.0488	0.0000	0.0214
3.8571	0.0317	0.0507	0.0000	0.0214
4.0055	0.0317	0.0527	0.0000	0.0214

4.1538	0.0317	0.0546	0.0000	0.0214
4.3022	0.0317	0.0566	0.0000	0.0214
4.4505	0.0317	0.0585	0.0000	0.0214
4.5989	0.0317	0.0605	0.0000	0.0214
4.7473	0.0317	0.0624	0.0000	0.0214
4.8956	0.0317	0.0644	0.0000	0.0214
5.0440	0.0317	0.0663	0.0000	0.0214
5.1923	0.0317	0.0683	0.0000	0.0214
5.3407	0.0317	0.0702	0.0000	0.0214
5.4890	0.0317	0.0722	0.0000	0.0214
5.6374	0.0317	0.0741	0.0000	0.0214
5.7857	0.0317	0.0761	0.0000	0.0214
5.9341	0.0317	0.0780	0.0000	0.0214
6.0824	0.0317	0.0800	0.0000	0.0214
6.2308	0.0317	0.0819	0.0000	0.0214
6.3791	0.0317	0.0839	0.0000	0.0214
6.5275	0.0317	0.0858	0.0000	0.0214
6.6758	0.0317	0.0878	0.0000	0.0214
6.8242	0.0317	0.0897	0.0000	0.0214
6.9725	0.0317	0.0917	0.0000	0.0214
7.1209	0.0317	0.0936	0.0000	0.0214
7.2692	0.0317	0.0956	0.0000	0.0214
7.4176	0.0317	0.0975	0.0000	0.0214
7.5659	0.0317	0.0995	0.0000	0.0214
7.7143	0.0317	0.1014	0.0000	0.0214
7.8626	0.0317	0.1034	0.0000	0.0214
8.0110	0.0317	0.1053	0.0000	0.0214
8.1593	0.0317	0.1073	0.0000	0.0214
8.3077	0.0317	0.1092	0.0000	0.0214
8.4560	0.0317	0.1112	0.0000	0.0214
8.6044	0.0317	0.1131	0.0000	0.0214
8.7527	0.0317	0.1151	0.0000	0.0214
8.9011	0.0317	0.1170	0.0000	0.0214
9.0495	0.0317	0.1190	0.0000	0.0214
9.1978	0.0317	0.1209	0.0000	0.0214
9.3462	0.0317	0.1229	0.0000	0.0214
9.4945	0.0317	0.1248	0.0000	0.0214
9.6429	0.0317	0.1268	0.0000	0.0214
9.7912	0.0317	0.1287	0.0000	0.0214
9.9396	0.0317	0.1307	0.0000	0.0214
10.088	0.0317	0.1326	0.0000	0.0214
10.236	0.0317	0.1346	0.0000	0.0214
10.385	0.0317	0.1365	0.0000	0.0214
10.533	0.0317	0.1385	0.0000	0.0214
10.681	0.0317	0.1404	0.0000	0.0214
10.830	0.0317	0.1424	0.0000	0.0214
10.978	0.0317	0.1443	0.0000	0.0214
11.126	0.0317	0.1463	0.0000	0.0214
11.275	0.0317	0.1482	0.0000	0.0214
11.423	0.0317	0.1502	0.0000	0.0214
11.571	0.0317	0.1521	0.0000	0.0214
11.720	0.0317	0.1541	0.0000	0.0214
11.868	0.0317	0.1560	0.0000	0.0214
12.016	0.0317	0.1580	0.0000	0.0214
12.165	0.0317	0.1599	0.0000	0.0214
12.313	0.0317	0.1619	0.0000	0.0214
12.462	0.0317	0.1638	0.0000	0.0214
12.610	0.0317	0.1658	0.0000	0.0214

12.758	0.0317	0.1677	0.0000	0.0214
12.907	0.0317	0.1697	0.0000	0.0214
13.000	0.0317	0.1709	0.0000	0.0214

Bioretention Hydraulic Table

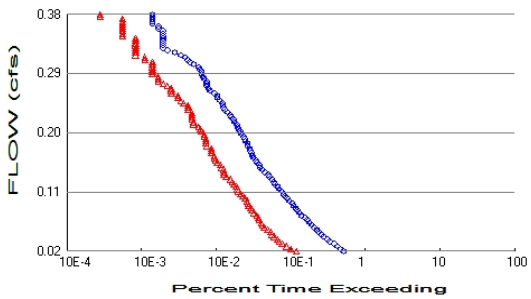
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
13.000	0.0317	0.1709	0.0000	16.027	0.0000
13.148	0.0317	0.1756	0.5952	16.027	0.0000
13.297	0.0317	0.1803	1.4914	16.208	0.0000
13.445	0.0317	0.1850	2.0897	16.389	0.0000
13.500	0.0317	0.1868	2.4263	16.456	0.0000

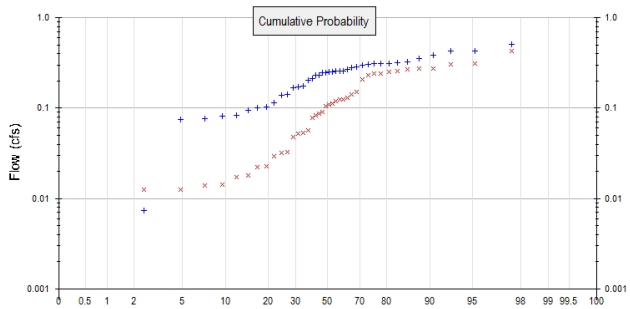
Surface Trench 11

Element Flows To:

Outlet 1	Outlet 2
	Trench 11

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.55
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.34
Total Impervious Area: 0.208

Flow Frequency Method: Weibull

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.248877
5 year	0.312879
10 year	0.376884
25 year	0.447068

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.105198
5 year	0.246627
10 year	0.275104
25 year	0.336991

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1960	0.139	0.029
1961	0.082	0.014
1962	0.266	0.105
1963	0.313	0.307
1964	0.384	0.209
1965	0.168	0.033
1966	0.076	0.017
1967	0.311	0.242
1968	0.433	0.431
1969	0.252	0.113
1970	0.279	0.084
1971	0.247	0.276
1972	0.075	0.014
1973	0.313	0.130

1974	0.231	0.125
1975	0.249	0.079
1976	0.000	0.013
1977	0.007	0.013
1978	0.213	0.141
1979	0.260	0.053
1980	0.354	0.315
1981	0.095	0.023
1982	0.424	0.234
1983	0.324	0.272
1984	0.174	0.087
1985	0.284	0.124
1986	0.321	0.243
1987	0.100	0.022
1988	0.202	0.057
1989	0.083	0.012
1990	0.103	0.048
1991	0.143	0.091
1992	0.308	0.250
1993	0.301	0.120
1994	0.170	0.032
1995	0.260	0.257
1996	0.506	0.268
1997	0.251	0.152
1998	0.260	0.109
1999	0.115	0.018
2000	0.232	0.054

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.5062	0.4306
2	0.4332	0.3150
3	0.4243	0.3070
4	0.3841	0.2761
5	0.3539	0.2720
6	0.3235	0.2682
7	0.3207	0.2575
8	0.3129	0.2496
9	0.3128	0.2427
10	0.3111	0.2415
11	0.3081	0.2337
12	0.3013	0.2086
13	0.2838	0.1524
14	0.2786	0.1412
15	0.2664	0.1302
16	0.2600	0.1254
17	0.2599	0.1236
18	0.2597	0.1201
19	0.2518	0.1132
20	0.2507	0.1088
21	0.2489	0.1052
22	0.2471	0.0914
23	0.2325	0.0872
24	0.2305	0.0836
25	0.2131	0.0790
26	0.2024	0.0572
27	0.1744	0.0536

28	0.1702	0.0527
29	0.1677	0.0481
30	0.1427	0.0326
31	0.1393	0.0317
32	0.1153	0.0295
33	0.1032	0.0226
34	0.1001	0.0223
35	0.0952	0.0180
36	0.0835	0.0171
37	0.0823	0.0141
38	0.0758	0.0139
39	0.0752	0.0127
40	0.0074	0.0127
41	0.0001	0.0123

Duration Flows

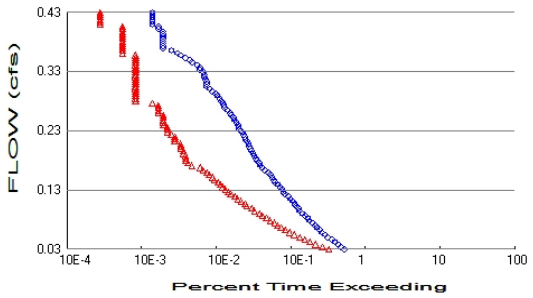
The Facility PASSED

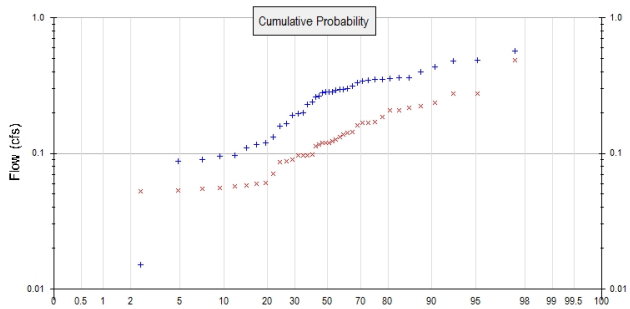
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0249	1842	426	23	Pass
0.0284	1654	358	21	Pass
0.0320	1530	318	20	Pass
0.0356	1374	276	20	Pass
0.0391	1208	251	20	Pass
0.0427	1106	238	21	Pass
0.0462	994	216	21	Pass
0.0498	928	201	21	Pass
0.0533	846	192	22	Pass
0.0569	805	177	21	Pass
0.0604	745	159	21	Pass
0.0640	692	150	21	Pass
0.0676	643	144	22	Pass
0.0711	596	135	22	Pass
0.0747	554	132	23	Pass
0.0782	498	126	25	Pass
0.0818	472	115	24	Pass
0.0853	438	107	24	Pass
0.0889	418	105	25	Pass
0.0924	390	97	24	Pass
0.0960	375	96	25	Pass
0.0996	349	93	26	Pass
0.1031	320	87	27	Pass
0.1067	300	82	27	Pass
0.1102	284	76	26	Pass
0.1138	274	72	26	Pass
0.1173	255	69	27	Pass
0.1209	239	67	28	Pass
0.1244	221	62	28	Pass
0.1280	213	59	27	Pass
0.1316	201	56	27	Pass
0.1351	187	49	26	Pass
0.1387	178	46	25	Pass
0.1422	160	45	28	Pass
0.1458	151	45	29	Pass
0.1493	139	42	30	Pass
0.1529	135	41	30	Pass
0.1564	128	37	28	Pass
0.1600	123	35	28	Pass
0.1636	115	34	29	Pass
0.1671	111	34	30	Pass
0.1707	107	31	28	Pass
0.1742	104	31	29	Pass
0.1778	101	31	30	Pass
0.1813	95	27	28	Pass
0.1849	94	26	27	Pass
0.1884	88	26	29	Pass
0.1920	86	26	30	Pass
0.1956	84	25	29	Pass
0.1991	79	25	31	Pass
0.2027	75	23	30	Pass
0.2062	72	22	30	Pass
0.2098	69	21	30	Pass

0.2133	68	18	26	Pass
0.2169	64	18	28	Pass
0.2204	61	17	27	Pass
0.2240	57	17	29	Pass
0.2276	55	17	30	Pass
0.2311	52	17	32	Pass
0.2347	47	15	31	Pass
0.2382	45	15	33	Pass
0.2418	44	15	34	Pass
0.2453	43	13	30	Pass
0.2489	41	12	29	Pass
0.2524	37	11	29	Pass
0.2560	37	11	29	Pass
0.2596	34	9	26	Pass
0.2631	30	9	30	Pass
0.2667	29	9	31	Pass
0.2702	27	8	29	Pass
0.2738	27	7	25	Pass
0.2773	27	6	22	Pass
0.2809	25	6	24	Pass
0.2844	24	6	25	Pass
0.2880	23	5	21	Pass
0.2916	23	5	21	Pass
0.2951	22	5	22	Pass
0.2987	21	5	23	Pass
0.3022	18	5	27	Pass
0.3058	16	5	31	Pass
0.3093	15	4	26	Pass
0.3129	14	4	28	Pass
0.3164	12	3	25	Pass
0.3200	10	3	30	Pass
0.3236	8	3	37	Pass
0.3271	7	3	42	Pass
0.3307	7	3	42	Pass
0.3342	7	3	42	Pass
0.3378	7	3	42	Pass
0.3413	7	3	42	Pass
0.3449	7	2	28	Pass
0.3484	7	2	28	Pass
0.3520	7	2	28	Pass
0.3556	6	2	33	Pass
0.3591	6	2	33	Pass
0.3627	5	2	40	Pass
0.3662	5	2	40	Pass
0.3698	5	2	40	Pass
0.3733	5	1	20	Pass
0.3769	5	1	20	Pass

Water Quality

POC 2





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #2
Total Pervious Area: 0.587
Total Impervious Area: 0.029

Mitigated Landuse Totals for POC #2
Total Pervious Area: 0.296
Total Impervious Area: 0.315

Flow Frequency Method: Weibull

Flow Frequency Return Periods for Predeveloped. POC #2

Return Period	**Flow(cfs)**
2 year	0.281899
5 year	0.353432
10 year	0.427774
25 year	0.503213

Flow Frequency Return Periods for Mitigated. POC #2

Return Period	**Flow(cfs)**
2 year	0.119491
5 year	0.198029
10 year	0.232536
25 year	0.316467

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #2

Year	**Predeveloped**	**Mitigated**
1960	0.160	0.070
1961	0.095	0.049
1962	0.302	0.141
1963	0.353	0.274
1964	0.437	0.207
1965	0.191	0.086
1966	0.090	0.055
1967	0.351	0.168
1968	0.487	0.485
1969	0.283	0.127
1970	0.316	0.133
1971	0.279	0.222
1972	0.088	0.053
1973	0.354	0.144
1974	0.261	0.119

1975	0.285	0.120
1976	0.015	0.060
1977	0.015	0.060
1978	0.240	0.096
1979	0.296	0.122
1980	0.398	0.185
1981	0.110	0.058
1982	0.479	0.217
1983	0.364	0.236
1984	0.200	0.087
1985	0.330	0.162
1986	0.361	0.167
1987	0.116	0.057
1988	0.230	0.097
1989	0.097	0.052
1990	0.119	0.090
1991	0.165	0.098
1992	0.347	0.171
1993	0.342	0.137
1994	0.196	0.096
1995	0.292	0.209
1996	0.571	0.277
1997	0.282	0.119
1998	0.295	0.116
1999	0.132	0.055
2000	0.266	0.112

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #2

Rank	Predeveloped	Mitigated
1	0.5712	0.4853
2	0.4872	0.2767
3	0.4787	0.2742
4	0.4372	0.2357
5	0.3975	0.2225
6	0.3636	0.2173
7	0.3607	0.2086
8	0.3541	0.2074
9	0.3525	0.1855
10	0.3507	0.1714
11	0.3471	0.1680
12	0.3416	0.1673
13	0.3299	0.1621
14	0.3156	0.1439
15	0.3016	0.1410
16	0.2960	0.1372
17	0.2952	0.1327
18	0.2919	0.1272
19	0.2848	0.1224
20	0.2832	0.1200
21	0.2819	0.1195
22	0.2790	0.1188
23	0.2660	0.1160
24	0.2610	0.1123
25	0.2405	0.0984
26	0.2295	0.0970
27	0.1997	0.0962
28	0.1963	0.0962

29	0.1913	0.0899
30	0.1649	0.0874
31	0.1598	0.0858
32	0.1319	0.0702
33	0.1194	0.0604
34	0.1157	0.0598
35	0.1098	0.0581
36	0.0971	0.0570
37	0.0950	0.0554
38	0.0898	0.0545
39	0.0879	0.0530
40	0.0150	0.0523
41	0.0146	0.0487

Duration Flows

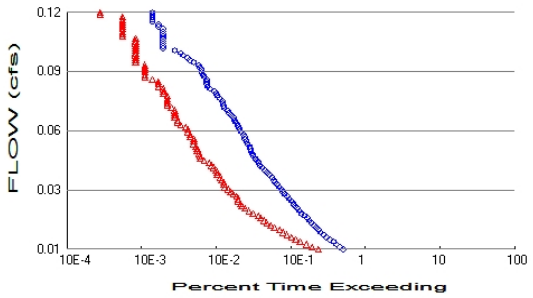
The Facility PASSED

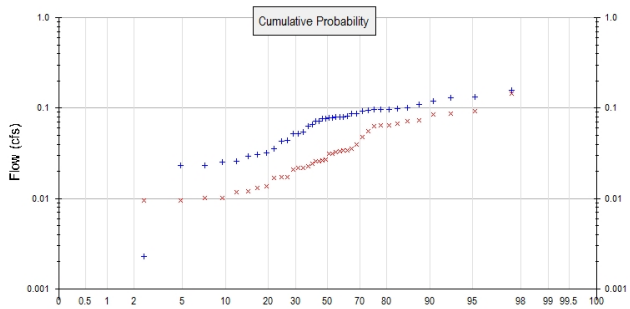
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0282	1865	1169	62	Pass
0.0322	1706	954	55	Pass
0.0363	1558	779	50	Pass
0.0403	1405	649	46	Pass
0.0443	1271	556	43	Pass
0.0484	1129	476	42	Pass
0.0524	1031	405	39	Pass
0.0564	946	349	36	Pass
0.0605	876	303	34	Pass
0.0645	809	266	32	Pass
0.0686	759	238	31	Pass
0.0726	698	219	31	Pass
0.0766	647	191	29	Pass
0.0807	610	171	28	Pass
0.0847	557	149	26	Pass
0.0887	515	136	26	Pass
0.0928	475	118	24	Pass
0.0968	451	107	23	Pass
0.1008	424	92	21	Pass
0.1049	403	88	21	Pass
0.1089	379	78	20	Pass
0.1130	356	70	19	Pass
0.1170	334	64	19	Pass
0.1210	303	56	18	Pass
0.1251	286	52	18	Pass
0.1291	275	48	17	Pass
0.1331	258	44	17	Pass
0.1372	240	41	17	Pass
0.1412	222	38	17	Pass
0.1452	211	34	16	Pass
0.1493	203	32	15	Pass
0.1533	190	29	15	Pass
0.1573	178	27	15	Pass
0.1614	160	24	15	Pass
0.1654	148	22	14	Pass
0.1695	142	17	11	Pass
0.1735	136	15	11	Pass
0.1775	127	14	11	Pass
0.1816	122	14	11	Pass
0.1856	116	14	12	Pass
0.1896	113	13	11	Pass
0.1937	107	13	12	Pass
0.1977	103	12	11	Pass
0.2017	100	12	12	Pass
0.2058	98	12	12	Pass
0.2098	93	10	10	Pass
0.2139	88	10	11	Pass
0.2179	86	10	11	Pass
0.2219	83	9	10	Pass
0.2260	81	8	9	Pass
0.2300	73	8	10	Pass
0.2340	72	8	11	Pass
0.2381	70	7	10	Pass

0.2421	67	7	10	Pass
0.2461	64	7	10	Pass
0.2502	61	7	11	Pass
0.2542	57	7	12	Pass
0.2583	55	6	10	Pass
0.2623	52	6	11	Pass
0.2663	47	6	12	Pass
0.2704	46	6	13	Pass
0.2744	44	5	11	Pass
0.2784	42	3	7	Pass
0.2825	40	3	7	Pass
0.2865	37	3	8	Pass
0.2905	35	3	8	Pass
0.2946	32	3	9	Pass
0.2986	30	3	10	Pass
0.3027	27	3	11	Pass
0.3067	27	3	11	Pass
0.3107	27	3	11	Pass
0.3148	26	3	11	Pass
0.3188	25	3	12	Pass
0.3228	25	3	12	Pass
0.3269	24	3	12	Pass
0.3309	22	3	13	Pass
0.3349	22	3	13	Pass
0.3390	20	3	15	Pass
0.3430	17	3	17	Pass
0.3470	16	3	18	Pass
0.3511	14	3	21	Pass
0.3551	12	3	25	Pass
0.3592	11	2	18	Pass
0.3632	9	2	22	Pass
0.3672	7	2	28	Pass
0.3713	7	2	28	Pass
0.3753	7	2	28	Pass
0.3793	7	2	28	Pass
0.3834	7	2	28	Pass
0.3874	7	2	28	Pass
0.3914	7	2	28	Pass
0.3955	7	2	28	Pass
0.3995	6	2	33	Pass
0.4036	6	2	33	Pass
0.4076	5	1	20	Pass
0.4116	5	1	20	Pass
0.4157	5	1	20	Pass
0.4197	5	1	20	Pass
0.4237	5	1	20	Pass
0.4278	5	1	20	Pass

Water Quality

POC 3





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #3
Total Pervious Area: 0.17
Total Impervious Area: 0

Mitigated Landuse Totals for POC #3
Total Pervious Area: 0.1
Total Impervious Area: 0.07

Flow Frequency Method: Weibull

Flow Frequency Return Periods for Predeveloped. POC #3

Return Period	**Flow(cfs)**
2 year	0.076926
5 year	0.096708
10 year	0.116492
25 year	0.138184

Flow Frequency Return Periods for Mitigated. POC #3

Return Period	**Flow(cfs)**
2 year	0.026884
5 year	0.064583
10 year	0.08234
25 year	0.102267

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #3

Year	**Predeveloped**	**Mitigated**
1960	0.043	0.017
1961	0.025	0.010
1962	0.082	0.036
1963	0.097	0.092
1964	0.119	0.064
1965	0.052	0.017
1966	0.023	0.012
1967	0.096	0.055
1968	0.134	0.144
1969	0.078	0.034
1970	0.086	0.031
1971	0.076	0.067
1972	0.023	0.010
1973	0.097	0.034
1974	0.071	0.032

1975	0.077	0.026
1976	0.000	0.009
1977	0.002	0.010
1978	0.066	0.026
1979	0.080	0.027
1980	0.109	0.063
1981	0.029	0.014
1982	0.131	0.072
1983	0.100	0.086
1984	0.054	0.021
1985	0.088	0.040
1986	0.099	0.048
1987	0.031	0.013
1988	0.063	0.023
1989	0.026	0.009
1990	0.032	0.017
1991	0.044	0.022
1992	0.095	0.065
1993	0.093	0.031
1994	0.053	0.022
1995	0.080	0.073
1996	0.156	0.085
1997	0.077	0.033
1998	0.080	0.026
1999	0.036	0.012
2000	0.072	0.024

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #3

Rank	**Predeveloped**	**Mitigated**
1	0.1565	0.1439
2	0.1339	0.0925
3	0.1312	0.0862
4	0.1187	0.0853
5	0.1094	0.0730
6	0.1000	0.0722
7	0.0991	0.0672
8	0.0967	0.0647
9	0.0967	0.0644
10	0.0962	0.0627
11	0.0952	0.0555
12	0.0931	0.0482
13	0.0877	0.0399
14	0.0861	0.0356
15	0.0823	0.0344
16	0.0804	0.0339
17	0.0803	0.0331
18	0.0803	0.0325
19	0.0778	0.0314
20	0.0775	0.0311
21	0.0769	0.0269
22	0.0764	0.0262
23	0.0719	0.0257
24	0.0712	0.0257
25	0.0659	0.0244
26	0.0626	0.0230
27	0.0539	0.0220
28	0.0526	0.0216

29	0.0518	0.0209
30	0.0441	0.0173
31	0.0430	0.0172
32	0.0357	0.0168
33	0.0319	0.0137
34	0.0309	0.0132
35	0.0294	0.0119
36	0.0258	0.0118
37	0.0254	0.0102
38	0.0234	0.0102
39	0.0232	0.0096
40	0.0023	0.0094
41	0.0000	0.0090

Duration Flows

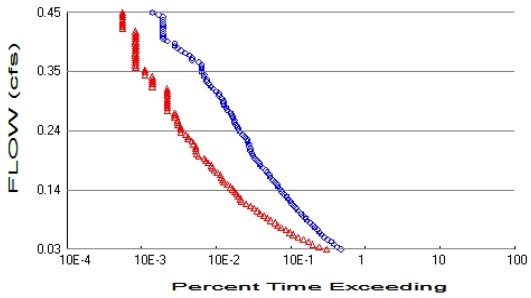
The Facility PASSED

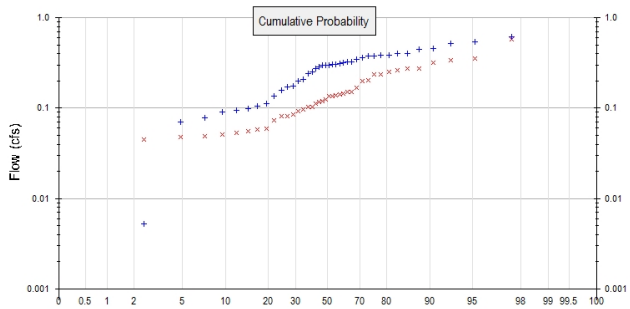
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0077	1796	841	46	Pass
0.0088	1639	689	42	Pass
0.0099	1483	580	39	Pass
0.0110	1356	482	35	Pass
0.0121	1206	418	34	Pass
0.0132	1089	366	33	Pass
0.0143	990	322	32	Pass
0.0154	909	282	31	Pass
0.0165	843	253	30	Pass
0.0176	786	216	27	Pass
0.0187	739	193	26	Pass
0.0198	680	172	25	Pass
0.0209	637	157	24	Pass
0.0220	596	142	23	Pass
0.0231	548	132	24	Pass
0.0242	496	113	22	Pass
0.0253	467	99	21	Pass
0.0264	437	87	19	Pass
0.0275	412	80	19	Pass
0.0286	389	76	19	Pass
0.0297	366	71	19	Pass
0.0308	348	71	20	Pass
0.0319	319	68	21	Pass
0.0330	297	61	20	Pass
0.0341	283	56	19	Pass
0.0352	271	52	19	Pass
0.0363	255	47	18	Pass
0.0374	238	46	19	Pass
0.0385	219	45	20	Pass
0.0396	211	42	19	Pass
0.0407	201	41	20	Pass
0.0418	186	37	19	Pass
0.0429	175	37	21	Pass
0.0440	160	36	22	Pass
0.0451	150	33	22	Pass
0.0462	139	31	22	Pass
0.0473	134	29	21	Pass
0.0484	127	25	19	Pass
0.0495	121	22	18	Pass
0.0506	113	22	19	Pass
0.0517	111	21	18	Pass
0.0528	105	20	19	Pass
0.0538	104	20	19	Pass
0.0549	101	19	18	Pass
0.0560	95	18	18	Pass
0.0571	91	18	19	Pass
0.0582	87	18	20	Pass
0.0593	86	16	18	Pass
0.0604	83	16	19	Pass
0.0615	79	15	18	Pass
0.0626	74	15	20	Pass
0.0637	72	14	19	Pass
0.0648	69	12	17	Pass

0.0659	66	11	16	Pass
0.0670	64	11	17	Pass
0.0681	61	10	16	Pass
0.0692	57	10	17	Pass
0.0703	54	10	18	Pass
0.0714	52	10	19	Pass
0.0725	46	9	19	Pass
0.0736	45	8	17	Pass
0.0747	44	8	18	Pass
0.0758	43	8	18	Pass
0.0769	41	8	19	Pass
0.0780	37	8	21	Pass
0.0791	36	7	19	Pass
0.0802	34	7	20	Pass
0.0813	30	7	23	Pass
0.0824	28	6	21	Pass
0.0835	27	6	22	Pass
0.0846	27	6	22	Pass
0.0857	27	5	18	Pass
0.0868	25	4	16	Pass
0.0879	24	4	16	Pass
0.0890	23	4	17	Pass
0.0901	23	4	17	Pass
0.0912	22	4	18	Pass
0.0923	21	4	19	Pass
0.0934	18	3	16	Pass
0.0945	16	3	18	Pass
0.0956	15	3	20	Pass
0.0967	13	3	23	Pass
0.0978	12	3	25	Pass
0.0989	10	3	30	Pass
0.1000	7	3	42	Pass
0.1011	7	3	42	Pass
0.1022	7	3	42	Pass
0.1033	7	3	42	Pass
0.1044	7	3	42	Pass
0.1055	7	2	28	Pass
0.1066	7	2	28	Pass
0.1077	7	2	28	Pass
0.1088	7	2	28	Pass
0.1099	6	2	33	Pass
0.1110	6	2	33	Pass
0.1121	5	2	40	Pass
0.1132	5	2	40	Pass
0.1143	5	2	40	Pass
0.1154	5	1	20	Pass
0.1165	5	1	20	Pass

Water Quality

POC 4





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #4
Total Pervious Area: 0.7
Total Impervious Area: 0

Mitigated Landuse Totals for POC #4
Total Pervious Area: 0.402
Total Impervious Area: 0.303

Flow Frequency Method: Weibull

Flow Frequency Return Periods for Predeveloped. POC #4

Return Period	**Flow(cfs)**
2 year	0.297573
5 year	0.386062
10 year	0.453419
25 year	0.555657

Flow Frequency Return Periods for Mitigated. POC #4

Return Period	**Flow(cfs)**
2 year	0.123996
5 year	0.244416
10 year	0.307215
25 year	0.39478

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #4

Year	**Predeveloped**	**Mitigated**
1960	0.159	0.074
1961	0.091	0.044
1962	0.322	0.153
1963	0.389	0.352
1964	0.456	0.251
1965	0.198	0.081
1966	0.070	0.053
1967	0.381	0.203
1968	0.540	0.576
1969	0.308	0.144
1970	0.345	0.139
1971	0.301	0.263
1972	0.078	0.049
1973	0.375	0.151
1974	0.284	0.136

1975	0.298	0.120
1976	0.000	0.048
1977	0.005	0.051
1978	0.253	0.103
1979	0.308	0.124
1980	0.445	0.235
1981	0.099	0.060
1982	0.524	0.277
1983	0.406	0.317
1984	0.207	0.085
1985	0.297	0.169
1986	0.400	0.197
1987	0.106	0.058
1988	0.241	0.102
1989	0.094	0.045
1990	0.113	0.082
1991	0.171	0.093
1992	0.383	0.236
1993	0.365	0.142
1994	0.177	0.098
1995	0.327	0.277
1996	0.622	0.339
1997	0.313	0.137
1998	0.316	0.118
1999	0.136	0.056
2000	0.276	0.113

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #4

Rank	**Predeveloped**	**Mitigated**
1	0.6221	0.5762
2	0.5400	0.3521
3	0.5244	0.3387
4	0.4562	0.3167
5	0.4446	0.2769
6	0.4058	0.2766
7	0.4002	0.2634
8	0.3885	0.2508
9	0.3828	0.2359
10	0.3806	0.2355
11	0.3750	0.2031
12	0.3655	0.1974
13	0.3449	0.1689
14	0.3275	0.1527
15	0.3222	0.1507
16	0.3159	0.1440
17	0.3128	0.1417
18	0.3082	0.1391
19	0.3075	0.1374
20	0.3015	0.1358
21	0.2976	0.1240
22	0.2975	0.1199
23	0.2837	0.1179
24	0.2760	0.1126
25	0.2526	0.1030
26	0.2407	0.1023
27	0.2068	0.0976
28	0.1977	0.0934

29	0.1767	0.0854
30	0.1706	0.0819
31	0.1589	0.0808
32	0.1356	0.0736
33	0.1128	0.0599
34	0.1064	0.0579
35	0.0992	0.0556
36	0.0939	0.0532
37	0.0910	0.0512
38	0.0781	0.0486
39	0.0698	0.0475
40	0.0053	0.0447
41	0.0001	0.0443

Duration Flows

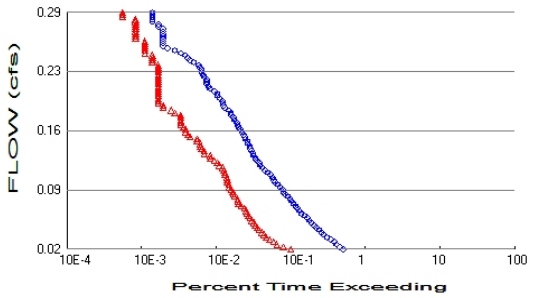
The Facility PASSED

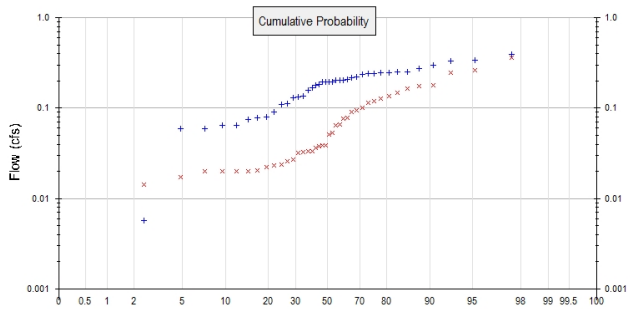
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0298	1683	1084	64	Pass
0.0340	1496	859	57	Pass
0.0383	1379	713	51	Pass
0.0426	1266	622	49	Pass
0.0469	1128	533	47	Pass
0.0512	1009	453	44	Pass
0.0554	939	390	41	Pass
0.0597	872	350	40	Pass
0.0640	817	309	37	Pass
0.0683	747	266	35	Pass
0.0726	706	241	34	Pass
0.0768	657	222	33	Pass
0.0811	601	193	32	Pass
0.0854	572	175	30	Pass
0.0897	523	156	29	Pass
0.0939	496	140	28	Pass
0.0982	450	127	28	Pass
0.1025	422	115	27	Pass
0.1068	392	104	26	Pass
0.1111	371	90	24	Pass
0.1153	361	79	21	Pass
0.1196	333	76	22	Pass
0.1239	317	71	22	Pass
0.1282	289	68	23	Pass
0.1325	273	65	23	Pass
0.1367	264	60	22	Pass
0.1410	247	56	22	Pass
0.1453	234	51	21	Pass
0.1496	218	46	21	Pass
0.1539	208	44	21	Pass
0.1581	193	42	21	Pass
0.1624	186	41	22	Pass
0.1667	174	37	21	Pass
0.1710	166	34	20	Pass
0.1753	149	32	21	Pass
0.1795	142	31	21	Pass
0.1838	136	28	20	Pass
0.1881	127	26	20	Pass
0.1924	118	25	21	Pass
0.1967	112	21	18	Pass
0.2009	108	20	18	Pass
0.2052	104	19	18	Pass
0.2095	102	19	18	Pass
0.2138	100	19	19	Pass
0.2181	99	18	18	Pass
0.2223	95	17	17	Pass
0.2266	92	15	16	Pass
0.2309	87	15	17	Pass
0.2352	81	14	17	Pass
0.2394	75	12	16	Pass
0.2437	72	12	16	Pass
0.2480	69	12	17	Pass
0.2523	66	11	16	Pass

0.2566	64	11	17	Pass
0.2608	64	11	17	Pass
0.2651	60	10	16	Pass
0.2694	58	10	17	Pass
0.2737	56	10	17	Pass
0.2780	51	8	15	Pass
0.2822	49	8	16	Pass
0.2865	46	8	17	Pass
0.2908	45	8	17	Pass
0.2951	45	8	17	Pass
0.2994	43	8	18	Pass
0.3036	39	8	20	Pass
0.3079	39	8	20	Pass
0.3122	36	8	22	Pass
0.3165	33	8	24	Pass
0.3208	31	5	16	Pass
0.3250	29	5	17	Pass
0.3293	27	5	18	Pass
0.3336	27	5	18	Pass
0.3379	25	5	20	Pass
0.3422	25	4	16	Pass
0.3464	23	4	17	Pass
0.3507	23	4	17	Pass
0.3550	23	3	13	Pass
0.3593	23	3	13	Pass
0.3636	21	3	14	Pass
0.3678	17	3	17	Pass
0.3721	17	3	17	Pass
0.3764	16	3	18	Pass
0.3807	14	3	21	Pass
0.3849	12	3	25	Pass
0.3892	11	3	27	Pass
0.3935	10	3	30	Pass
0.3978	10	3	30	Pass
0.4021	8	3	37	Pass
0.4063	7	3	42	Pass
0.4106	7	3	42	Pass
0.4149	7	3	42	Pass
0.4192	7	3	42	Pass
0.4235	7	2	28	Pass
0.4277	7	2	28	Pass
0.4320	7	2	28	Pass
0.4363	7	2	28	Pass
0.4406	7	2	28	Pass
0.4449	7	2	28	Pass
0.4491	6	2	33	Pass
0.4534	5	2	40	Pass

Water Quality

POC 5





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #5
Total Pervious Area: 0.43
Total Impervious Area: 0

Mitigated Landuse Totals for POC #5
Total Pervious Area: 0
Total Impervious Area: 0.43

Flow Frequency Method: Weibull

Flow Frequency Return Periods for Predeveloped. POC #5

Return Period	**Flow(cfs)**
2 year	0.194577
5 year	0.244615
10 year	0.294654
25 year	0.349526

Flow Frequency Return Periods for Mitigated. POC #5

Return Period	**Flow(cfs)**
2 year	0.03882
5 year	0.132839
10 year	0.178219
25 year	0.281741

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #5

Year	**Predeveloped**	**Mitigated**
1960	0.109	0.020
1961	0.064	0.022
1962	0.208	0.079
1963	0.245	0.264
1964	0.300	0.148
1965	0.131	0.026
1966	0.059	0.020
1967	0.243	0.176
1968	0.339	0.358
1969	0.197	0.033
1970	0.218	0.033
1971	0.193	0.246
1972	0.059	0.014
1973	0.245	0.077
1974	0.180	0.032

1975	0.195	0.036
1976	0.000	0.020
1977	0.006	0.020
1978	0.167	0.034
1979	0.203	0.038
1980	0.277	0.090
1981	0.074	0.020
1982	0.332	0.115
1983	0.253	0.179
1984	0.136	0.121
1985	0.222	0.094
1986	0.251	0.053
1987	0.078	0.024
1988	0.158	0.023
1989	0.065	0.017
1990	0.081	0.102
1991	0.112	0.039
1992	0.241	0.137
1993	0.236	0.051
1994	0.133	0.027
1995	0.203	0.164
1996	0.396	0.128
1997	0.196	0.065
1998	0.203	0.039
1999	0.090	0.014
2000	0.182	0.066

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #5

Rank	**Predeveloped**	**Mitigated**
1	0.3957	0.3581
2	0.3387	0.2638
3	0.3318	0.2456
4	0.3003	0.1789
5	0.2767	0.1761
6	0.2529	0.1636
7	0.2507	0.1485
8	0.2446	0.1368
9	0.2446	0.1276
10	0.2432	0.1209
11	0.2409	0.1148
12	0.2355	0.1015
13	0.2219	0.0945
14	0.2178	0.0901
15	0.2083	0.0789
16	0.2033	0.0771
17	0.2032	0.0663
18	0.2030	0.0652
19	0.1969	0.0532
20	0.1960	0.0513
21	0.1946	0.0388
22	0.1932	0.0387
23	0.1818	0.0378
24	0.1802	0.0362
25	0.1666	0.0336
26	0.1582	0.0334
27	0.1363	0.0327
28	0.1330	0.0318

29	0.1311	0.0270
30	0.1115	0.0260
31	0.1089	0.0235
32	0.0902	0.0231
33	0.0807	0.0221
34	0.0782	0.0203
35	0.0744	0.0201
36	0.0653	0.0199
37	0.0644	0.0199
38	0.0593	0.0199
39	0.0588	0.0172
40	0.0058	0.0143
41	0.0001	0.0140

Duration Flows

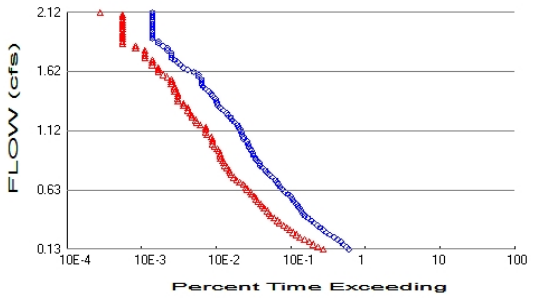
The Facility PASSED

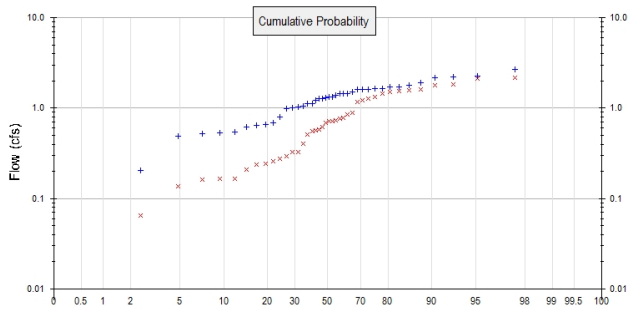
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0195	1831	359	19	Pass
0.0222	1648	285	17	Pass
0.0250	1483	236	15	Pass
0.0278	1386	211	15	Pass
0.0306	1232	186	15	Pass
0.0334	1099	168	15	Pass
0.0361	993	156	15	Pass
0.0389	929	147	15	Pass
0.0417	859	135	15	Pass
0.0445	800	128	16	Pass
0.0473	744	121	16	Pass
0.0500	680	116	17	Pass
0.0528	648	108	16	Pass
0.0556	600	102	17	Pass
0.0584	551	97	17	Pass
0.0612	498	92	18	Pass
0.0639	475	91	19	Pass
0.0667	443	86	19	Pass
0.0695	416	78	18	Pass
0.0723	390	72	18	Pass
0.0751	366	70	19	Pass
0.0778	351	70	19	Pass
0.0806	327	63	19	Pass
0.0834	299	61	20	Pass
0.0862	284	60	21	Pass
0.0890	278	57	20	Pass
0.0917	256	53	20	Pass
0.0945	239	53	22	Pass
0.0973	221	51	23	Pass
0.1001	211	51	24	Pass
0.1029	204	50	24	Pass
0.1056	190	47	24	Pass
0.1084	177	47	26	Pass
0.1112	160	45	28	Pass
0.1140	151	44	29	Pass
0.1167	140	40	28	Pass
0.1195	135	37	27	Pass
0.1223	127	34	26	Pass
0.1251	121	30	24	Pass
0.1279	115	30	26	Pass
0.1306	112	25	22	Pass
0.1334	107	25	23	Pass
0.1362	104	23	22	Pass
0.1390	101	22	21	Pass
0.1418	96	22	22	Pass
0.1445	94	20	21	Pass
0.1473	88	20	22	Pass
0.1501	86	16	18	Pass
0.1529	84	15	17	Pass
0.1557	80	14	17	Pass
0.1584	75	14	18	Pass
0.1612	72	13	18	Pass
0.1640	69	12	17	Pass

0.1668	68	12	17	Pass
0.1696	64	12	18	Pass
0.1723	61	12	19	Pass
0.1751	57	12	21	Pass
0.1779	56	10	17	Pass
0.1807	53	9	16	Pass
0.1835	47	7	14	Pass
0.1862	45	7	15	Pass
0.1890	44	6	13	Pass
0.1918	43	6	13	Pass
0.1946	41	6	14	Pass
0.1974	37	6	16	Pass
0.2001	37	6	16	Pass
0.2029	34	6	17	Pass
0.2057	30	6	20	Pass
0.2085	29	6	20	Pass
0.2113	27	6	22	Pass
0.2140	27	6	22	Pass
0.2168	27	6	22	Pass
0.2196	25	6	24	Pass
0.2224	24	6	25	Pass
0.2252	23	6	26	Pass
0.2279	23	6	26	Pass
0.2307	22	6	27	Pass
0.2335	21	6	28	Pass
0.2363	18	5	27	Pass
0.2391	16	5	31	Pass
0.2418	15	5	33	Pass
0.2446	14	5	35	Pass
0.2474	12	4	33	Pass
0.2502	10	4	40	Pass
0.2530	8	4	50	Pass
0.2557	7	4	57	Pass
0.2585	7	4	57	Pass
0.2613	7	4	57	Pass
0.2641	7	3	42	Pass
0.2669	7	3	42	Pass
0.2696	7	3	42	Pass
0.2724	7	3	42	Pass
0.2752	7	3	42	Pass
0.2780	6	3	50	Pass
0.2808	6	3	50	Pass
0.2835	5	3	60	Pass
0.2863	5	3	60	Pass
0.2891	5	2	40	Pass
0.2919	5	2	40	Pass
0.2947	5	2	40	Pass

Water Quality

POC 6





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #6
Total Pervious Area: 2.71
Total Impervious Area: 0

Mitigated Landuse Totals for POC #6
Total Pervious Area: 2.38
Total Impervious Area: 0.33

Flow Frequency Method: Weibull

Flow Frequency Return Periods for Predeveloped. POC #6

Return Period	**Flow(cfs)**
2 year	1.29955
5 year	1.684976
10 year	2.115347
25 year	2.335458

Flow Frequency Return Periods for Mitigated. POC #6

Return Period	**Flow(cfs)**
2 year	0.686842
5 year	1.473011
10 year	1.74956
25 year	2.119454

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #6

Year	**Predeveloped**	**Mitigated**
1960	0.803	0.276
1961	0.519	0.165
1962	1.450	0.781
1963	1.621	1.602
1964	2.185	1.212
1965	0.979	0.325
1966	0.543	0.162
1967	1.626	1.439
1968	2.214	2.186
1969	1.284	0.843
1970	1.496	0.758
1971	1.341	1.321
1972	0.493	0.164
1973	1.706	0.741
1974	1.228	0.716

1975	1.390	0.507
1976	0.002	0.045
1977	0.204	0.064
1978	1.128	0.687
1979	1.465	0.584
1980	1.787	1.848
1981	0.656	0.245
1982	2.251	1.796
1983	1.640	1.559
1984	1.020	0.326
1985	1.891	0.885
1986	1.715	1.588
1987	0.614	0.259
1988	1.132	0.620
1989	0.532	0.137
1990	0.690	0.239
1991	1.045	0.554
1992	1.600	1.499
1993	1.657	0.715
1994	1.041	0.293
1995	1.300	1.276
1996	2.692	2.104
1997	1.273	1.178
1998	1.449	0.570
1999	0.650	0.207
2000	1.329	0.404

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #6

Rank	Predeveloped	Mitigated
1	2.6923	2.1856
2	2.2515	2.1039
3	2.2143	1.8483
4	2.1854	1.7956
5	1.8911	1.6024
6	1.7867	1.5879
7	1.7147	1.5591
8	1.7057	1.4986
9	1.6574	1.4388
10	1.6401	1.3205
11	1.6260	1.2758
12	1.6209	1.2120
13	1.5999	1.1780
14	1.4965	0.8855
15	1.4647	0.8433
16	1.4497	0.7809
17	1.4491	0.7578
18	1.3904	0.7406
19	1.3412	0.7160
20	1.3286	0.7152
21	1.2996	0.6868
22	1.2839	0.6198
23	1.2733	0.5842
24	1.2280	0.5695
25	1.1322	0.5544
26	1.1277	0.5069
27	1.0450	0.4044
28	1.0406	0.3261

29	1.0198	0.3251
30	0.9792	0.2927
31	0.8032	0.2762
32	0.6903	0.2594
33	0.6560	0.2450
34	0.6497	0.2388
35	0.6137	0.2072
36	0.5434	0.1651
37	0.5316	0.1637
38	0.5194	0.1616
39	0.4927	0.1374
40	0.2041	0.0643
41	0.0021	0.0452

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1300	2156	980	45	Pass
0.1500	1988	834	41	Pass
0.1701	1830	718	39	Pass
0.1901	1701	642	37	Pass
0.2102	1541	549	35	Pass
0.2302	1366	475	34	Pass
0.2503	1210	427	35	Pass
0.2703	1068	385	36	Pass
0.2904	982	348	35	Pass
0.3104	894	322	36	Pass
0.3305	810	289	35	Pass
0.3506	745	255	34	Pass
0.3706	683	238	34	Pass
0.3907	613	214	34	Pass
0.4107	552	194	35	Pass
0.4308	524	185	35	Pass
0.4508	496	176	35	Pass
0.4709	471	159	33	Pass
0.4909	447	149	33	Pass
0.5110	426	142	33	Pass
0.5310	398	130	32	Pass
0.5511	375	123	32	Pass
0.5712	355	118	33	Pass
0.5912	328	107	32	Pass
0.6113	299	104	34	Pass
0.6313	276	94	34	Pass
0.6514	260	89	34	Pass
0.6714	243	83	34	Pass
0.6915	234	74	31	Pass
0.7115	223	68	30	Pass
0.7316	204	62	30	Pass
0.7516	187	57	30	Pass
0.7717	172	55	31	Pass
0.7918	164	54	32	Pass
0.8118	150	50	33	Pass
0.8319	138	47	34	Pass
0.8519	135	45	33	Pass
0.8720	128	44	34	Pass
0.8920	121	41	33	Pass
0.9121	114	41	35	Pass
0.9321	112	41	36	Pass
0.9522	106	39	36	Pass
0.9722	104	37	35	Pass
0.9923	98	34	34	Pass
1.0124	96	32	33	Pass
1.0324	92	32	34	Pass
1.0525	84	32	38	Pass
1.0725	84	31	36	Pass
1.0926	80	27	33	Pass
1.1126	79	26	32	Pass
1.1327	75	26	34	Pass
1.1527	72	26	36	Pass
1.1728	69	22	31	Pass

1.1928	63	20	31	Pass
1.2129	59	19	32	Pass
1.2330	56	17	30	Pass
1.2530	52	17	32	Pass
1.2731	50	16	32	Pass
1.2931	45	15	33	Pass
1.3132	41	15	36	Pass
1.3332	38	13	34	Pass
1.3533	37	13	35	Pass
1.3733	36	11	30	Pass
1.3934	35	11	31	Pass
1.4134	32	11	34	Pass
1.4335	31	11	35	Pass
1.4535	29	10	34	Pass
1.4736	26	10	38	Pass
1.4937	24	10	41	Pass
1.5137	23	9	39	Pass
1.5338	23	9	39	Pass
1.5538	23	9	39	Pass
1.5739	21	8	38	Pass
1.5939	21	7	33	Pass
1.6140	18	6	33	Pass
1.6340	15	6	40	Pass
1.6541	13	6	46	Pass
1.6741	12	5	41	Pass
1.6942	11	5	45	Pass
1.7143	10	5	50	Pass
1.7343	9	4	44	Pass
1.7544	9	4	44	Pass
1.7744	9	4	44	Pass
1.7945	8	4	50	Pass
1.8145	8	3	37	Pass
1.8346	7	3	42	Pass
1.8546	6	2	33	Pass
1.8747	6	2	33	Pass
1.8947	5	2	40	Pass
1.9148	5	2	40	Pass
1.9349	5	2	40	Pass
1.9549	5	2	40	Pass
1.9750	5	2	40	Pass
1.9950	5	2	40	Pass
2.0151	5	2	40	Pass
2.0351	5	2	40	Pass
2.0552	5	2	40	Pass
2.0752	5	2	40	Pass
2.0953	5	2	40	Pass
2.1153	5	1	20	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

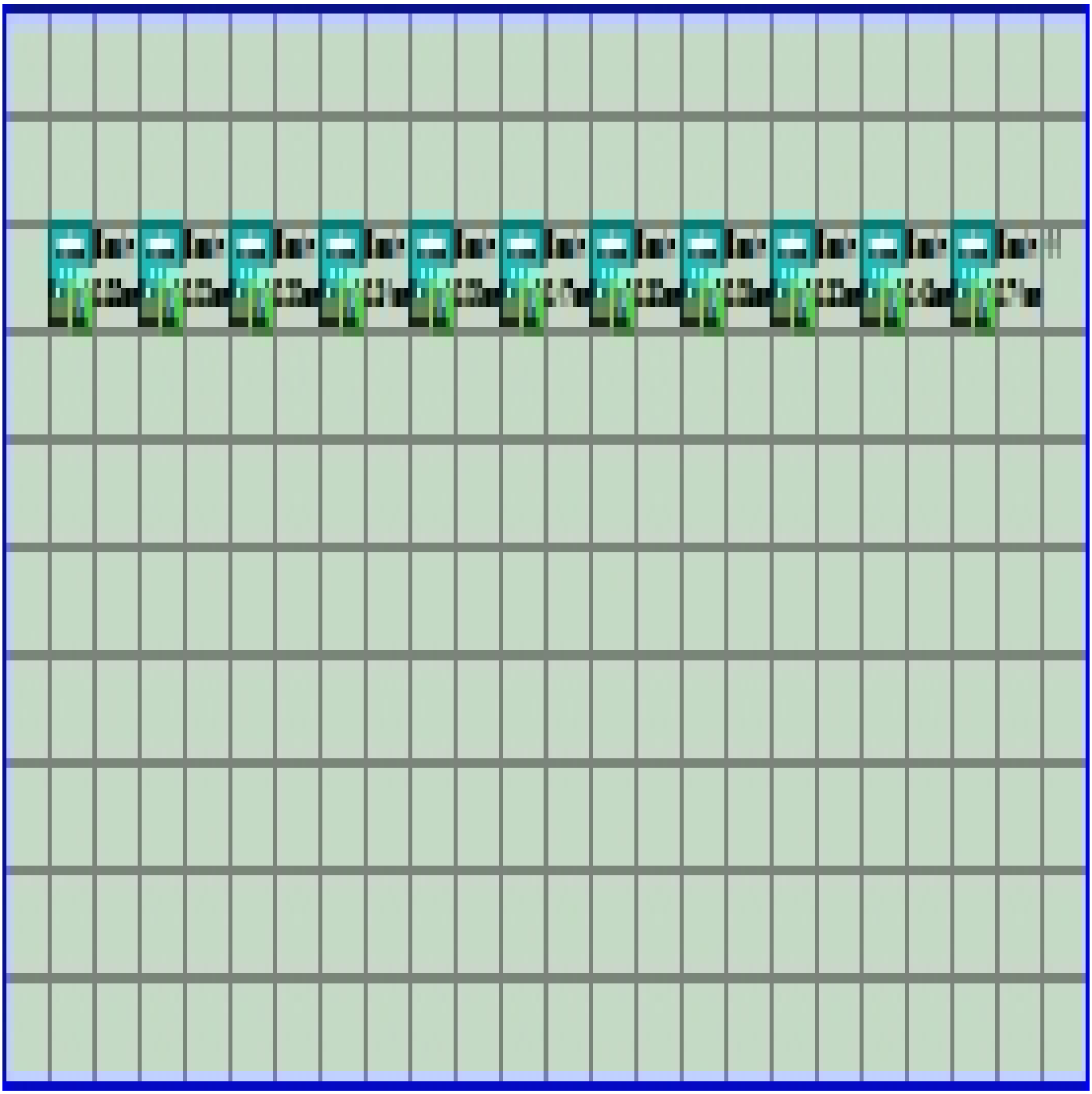
No PERLND changes have been made.

IMPLND Changes

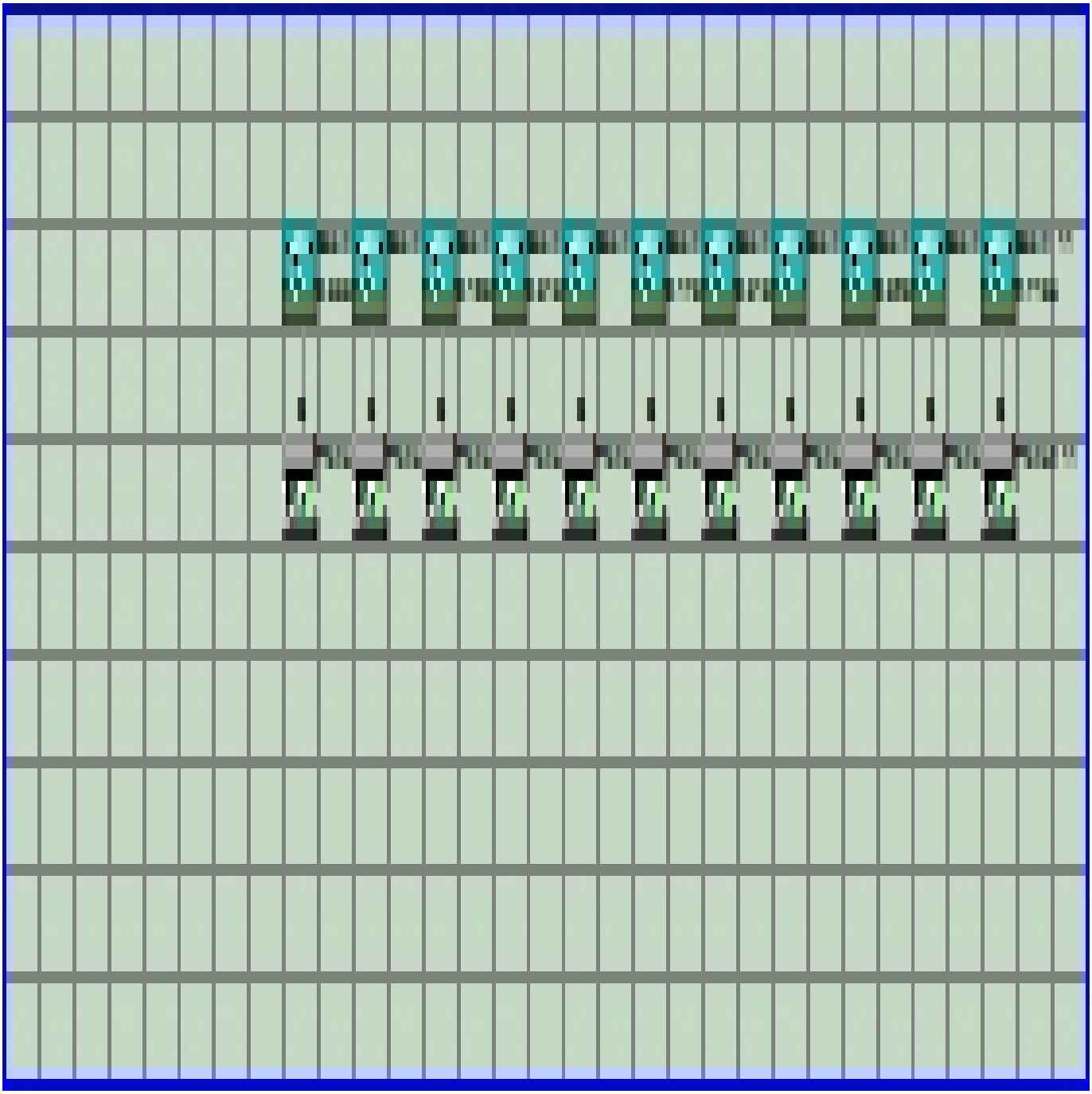
No IMPLND changes have been made.

Appendix

Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1959 10 01        END    2000 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                                ***
WDM        26   216053 BAHM 07-14-2016.wdm
MESSU      25   Pre216053 BAHM 07-14-2016.MES
           27   Pre216053 BAHM 07-14-2016.L61
           28   Pre216053 BAHM 07-14-2016.L62
           30   POC216053 BAHM 07-14-20161.dat
           31   POC216053 BAHM 07-14-20162.dat
           32   POC216053 BAHM 07-14-20163.dat
           33   POC216053 BAHM 07-14-20164.dat
           34   POC216053 BAHM 07-14-20165.dat
           35   POC216053 BAHM 07-14-20166.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      43
      IMPLND      10
      PERLND      42
      PERLND      44
      COPY       501
      COPY       502
      COPY       503
      COPY       504
      COPY       505
      COPY       506
      DISPLY       1
      DISPLY       2
      DISPLY       3
      DISPLY       4
      DISPLY       5
      DISPLY       6
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                    1    2   30    9
    2        Basin  2                   MAX                    1    2   31    9
    3        Basin  6                   MAX                    1    2   32    9
    4        Basin  7                   MAX                    1    2   33    9
    5        Basin  10                  MAX                    1    2   34    9
    6        Basin  11                  MAX                    1    2   35    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  502         1    1
  503         1    1
  504         1    1
  505         1    1
  506         1    1
  END TIMESERIES
END COPY
GENER
```

```
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                           in  out           ***
   43     C/D,Grass,Ste(10-20)    1    1    1    1   27    0
   42     C/D,Grass,Mod(5-10%)    1    1    1    1   27    0
   44     C/D,Grass,Very(>20%)    1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   43         0    0    1    0    0    0    0    0    0    0    0    0
   42         0    0    1    0    0    0    0    0    0    0    0    0
   44         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   43         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   42         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   44         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   43         0    0    0    1    0    0    0    0    1    0    0
   42         0    0    0    1    0    0    0    0    1    0    0
   44         0    0    0    1    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   43              0       4.2      0.03       300      0.15         2      0.95
   42              0       4.5      0.04       350       0.1         2      0.95
   44              0         4     0.025       200      0.25         2      0.95
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   43             40        35         3         2       0.5      0.15         0
   42             40        35         3         2       0.5      0.15         0
   44             40        35         3         2       0.5      0.15         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   43              0      0.25      0.25       0.8       0.4         0
   42              0       0.3      0.25       0.9      0.45         0
   44              0       0.2      0.25       0.6      0.35         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   43       0.4  0.4  0.4 0.45  0.5 0.55 0.55 0.55 0.55 0.55 0.45  0.4
   42       0.4  0.4  0.4 0.45  0.5 0.55 0.55 0.55 0.55 0.55 0.45  0.4
   44       0.4  0.4  0.4 0.45  0.5 0.55 0.55 0.55 0.55 0.55 0.45  0.4
```

```
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   43      0.12 0.12 0.12 0.11  0.1  0.1  0.1  0.1  0.1  0.1 0.11 0.12
   42      0.12 0.12 0.12 0.11  0.1  0.1  0.1  0.1  0.1  0.1 0.11 0.12
   44      0.12 0.12 0.12 0.11  0.1  0.1  0.1  0.1  0.1  0.1 0.11 0.12
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   43             0         0      0.01         0       0.5       0.3      0.01
   42             0         0      0.01         0       0.5       0.3      0.01
   44             0         0      0.01         0       0.5       0.3      0.01
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                       in  out           ***
   10     Sidewalks,Flat(0-5%)    1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
   10         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
   10         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
   10         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
   10           100      0.05       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
   10             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
   10             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
```

```
Basin  1***
PERLND  43                        0.55     COPY   501     12
PERLND  43                        0.55     COPY   501     13
Basin  2***
PERLND  43                        0.02     COPY   502     12
PERLND  43                        0.02     COPY   502     13
Basin  3***
PERLND  43                        0.18     COPY   502     12
PERLND  43                        0.18     COPY   502     13
IMPLND  10                       0.016     COPY   502     15
Basin  4***
PERLND  43                       0.297     COPY   502     12
PERLND  43                       0.297     COPY   502     13
IMPLND  10                       0.013     COPY   502     15
Basin  5***
PERLND  43                        0.09     COPY   502     12
PERLND  43                        0.09     COPY   502     13
Basin  6***
PERLND  43                        0.17     COPY   503     12
PERLND  43                        0.17     COPY   503     13
Basin  7***
PERLND  43                         0.3     COPY   504     12
PERLND  43                         0.3     COPY   504     13
Basin  8***
PERLND  43                        0.08     COPY   504     12
PERLND  43                        0.08     COPY   504     13
Basin  9***
PERLND  42                        0.32     COPY   504     12
PERLND  42                        0.32     COPY   504     13
Basin  10***
PERLND  43                        0.43     COPY   505     12
PERLND  43                        0.43     COPY   505     13
Basin  11***
PERLND  44                        2.71     COPY   506     12
PERLND  44                        2.71     COPY   506     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1
COPY   502 OUTPUT MEAN   1 1   12.1        DISPLY   2     INPUT  TIMSER 1
COPY   503 OUTPUT MEAN   1 1   12.1        DISPLY   3     INPUT  TIMSER 1
COPY   504 OUTPUT MEAN   1 1   12.1        DISPLY   4     INPUT  TIMSER 1
COPY   505 OUTPUT MEAN   1 1   12.1        DISPLY   5     INPUT  TIMSER 1
COPY   506 OUTPUT MEAN   1 1   12.1        DISPLY   6     INPUT  TIMSER 1


<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                         in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
```

```
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.448          PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.448          IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     12.1      WDM    501 FLOW     ENGL      REPL
COPY   502 OUTPUT MEAN   1 1     12.1      WDM    502 FLOW     ENGL      REPL
COPY   503 OUTPUT MEAN   1 1     12.1      WDM    503 FLOW     ENGL      REPL
COPY   504 OUTPUT MEAN   1 1     12.1      WDM    504 FLOW     ENGL      REPL
COPY   505 OUTPUT MEAN   1 1     12.1      WDM    505 FLOW     ENGL      REPL
COPY   506 OUTPUT MEAN   1 1     12.1      WDM    506 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1959 10 01        END    2000 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                               ***
WDM        26   216053 BAHM 07-14-2016.wdm
MESSU      25   Mit216053 BAHM 07-14-2016.MES
           27   Mit216053 BAHM 07-14-2016.L61
           28   Mit216053 BAHM 07-14-2016.L62
           30   POC216053 BAHM 07-14-20161.dat
           31   POC216053 BAHM 07-14-20162.dat
           32   POC216053 BAHM 07-14-20163.dat
           33   POC216053 BAHM 07-14-20164.dat
           34   POC216053 BAHM 07-14-20165.dat
           35   POC216053 BAHM 07-14-20166.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      43
      IMPLND       5
      IMPLND       8
      PERLND      44
      GENER        2
      RCHRES       1
      RCHRES       2
      GENER        4
      RCHRES       3
      RCHRES       4
      GENER        6
      RCHRES       5
      RCHRES       6
      GENER        8
      RCHRES       7
      RCHRES       8
      GENER       10
      RCHRES       9
      RCHRES      10
      GENER       12
      RCHRES      11
      RCHRES      12
      GENER       14
      RCHRES      13
      RCHRES      14
      GENER       16
      RCHRES      15
      RCHRES      16
      GENER       18
      RCHRES      17
      RCHRES      18
      GENER       20
      RCHRES      19
      RCHRES      20
      GENER       22
      RCHRES      21
      RCHRES      22
      COPY         1
      COPY       501
      COPY         2
      COPY       502
      COPY         3
```

```
      COPY       503
      COPY         4
      COPY       504
      COPY         5
      COPY       505
      COPY         6
      COPY       506
      DISPLY       1
      DISPLY       2
      DISPLY       3
      DISPLY       4
      DISPLY       5
      DISPLY       6
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Surface retention  1        MAX                    1    2   30    9
    2        Surface retention  2        MAX                    1    2   31    9
    3        Surface retention  6        MAX                    1    2   32    9
    4        Surface retention  7        MAX                    1    2   33    9
    5        Surface etention  10        MAX                    1    2   34    9
    6        Surface etention  11        MAX                    1    2   35    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
    2         1    1
  502         1    1
    3         1    1
  503         1    1
    4         1    1
  504         1    1
    5         1    1
  505         1    1
    6         1    1
  506         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
    2        24
    4        24
    6        24
    8        24
   10        24
   12        24
   14        24
   16        24
   18        24
   20        24
   22        24
  END OPCODE
  PARM
    #    #         K ***
    2             0.
    4             0.
    6             0.
    8             0.
   10             0.
   12             0.
   14             0.
   16             0.
   18             0.
   20             0.
```

```
   22             0.
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                            in  out           ***
   43     C/D,Grass,Ste(10-20)    1    1    1    1   27    0
   44     C/D,Grass,Very(>20%)    1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   43         0    0    1    0    0    0    0    0    0    0    0    0
   44         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   43         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   44         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   43         0    0    0    1    0    0    0    0    1    0    0
   44         0    0    0    1    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   43              0       4.2      0.03       300      0.15         2      0.95
   44              0         4     0.025       200      0.25         2      0.95
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   43             40        35         3         2       0.5      0.15         0
   44             40        35         3         2       0.5      0.15         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   43              0      0.25      0.25       0.8       0.4         0
   44              0       0.2      0.25       0.6      0.35         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   43       0.4  0.4  0.4 0.45  0.5 0.55 0.55 0.55 0.55 0.55 0.45  0.4
   44       0.4  0.4  0.4 0.45  0.5 0.55 0.55 0.55 0.55 0.55 0.45  0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   43      0.12 0.12 0.12 0.11  0.1  0.1  0.1  0.1  0.1  0.1 0.11 0.12
   44      0.12 0.12 0.12 0.11  0.1  0.1  0.1  0.1  0.1  0.1 0.11 0.12
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
```

```
   43              0         0      0.01         0       0.5       0.3      0.01
   44              0         0      0.01         0       0.5       0.3      0.01
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                       in  out           ***
    5     Roof Area                1    1    1   27    0
    8     Driveways,St(10-20%)     1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    5         0    0    1    0    0    0
    8         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    5         0    0    4    0    0    0    1    9
    8         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    5         0    0    0    0    0
    8         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    5            100      0.05       0.1       0.1
    8            100      0.15       0.1      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    5              0         0
    8              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    5              0         0
    8              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  43                        0.34     RCHRES   1      2
PERLND  43                        0.34     RCHRES   1      3
IMPLND   5                       0.147     RCHRES   1      5
IMPLND   8                       0.061     RCHRES   1      5
Basin  10***
IMPLND   8                        0.43     RCHRES  19      5
```

```
Basin  2***
IMPLND   8                        0.02     RCHRES   3       5
Basin  3***
PERLND  43                       0.106     RCHRES   5       2
PERLND  43                       0.106     RCHRES   5       3
IMPLND   5                       0.025     RCHRES   5       5
IMPLND   8                        0.06     RCHRES   5       5
Basin  4***
PERLND  43                        0.19     RCHRES   7       2
PERLND  43                        0.19     RCHRES   7       3
IMPLND   5                        0.12     RCHRES   7       5
Basin  5***
IMPLND   8                        0.09     RCHRES   9       5
Basin  6***
PERLND  43                         0.1     RCHRES  11       2
PERLND  43                         0.1     RCHRES  11       3
IMPLND   5                        0.07     RCHRES  11       5
Basin  7***
PERLND  43                       0.226     RCHRES  13       2
PERLND  43                       0.226     RCHRES  13       3
IMPLND   5                        0.08     RCHRES  13       5
Basin  8***
IMPLND   8                       0.076     RCHRES  15       5
Basin  9***
PERLND  43                       0.176     RCHRES  17       2
PERLND  43                       0.176     RCHRES  17       3
IMPLND   5                       0.147     RCHRES  17       5
Basin  11***
PERLND  44                        2.38     RCHRES  21       2
PERLND  44                        2.38     RCHRES  21       3
IMPLND   8                        0.33     RCHRES  21       5

******Routing******
PERLND  43                        0.34     COPY     1      12
IMPLND   5                       0.147     COPY     1      15
IMPLND   8                       0.061     COPY     1      15
PERLND  43                        0.34     COPY     1      13
IMPLND   8                        0.02     COPY     2      15
PERLND  43                       0.106     COPY     2      12
IMPLND   5                       0.025     COPY     2      15
IMPLND   8                        0.06     COPY     2      15
PERLND  43                       0.106     COPY     2      13
PERLND  43                        0.19     COPY     2      12
IMPLND   5                        0.12     COPY     2      15
PERLND  43                        0.19     COPY     2      13
IMPLND   8                        0.09     COPY     2      15
PERLND  43                         0.1     COPY     3      12
IMPLND   5                        0.07     COPY     3      15
PERLND  43                         0.1     COPY     3      13
PERLND  43                       0.226     COPY     4      12
IMPLND   5                        0.08     COPY     4      15
PERLND  43                       0.226     COPY     4      13
IMPLND   8                       0.076     COPY     4      15
PERLND  43                       0.176     COPY     4      12
IMPLND   5                       0.147     COPY     4      15
PERLND  43                       0.176     COPY     4      13
IMPLND   8                        0.43     COPY     5      15
PERLND  44                        2.38     COPY     6      12
IMPLND   8                        0.33     COPY     6      15
PERLND  44                        2.38     COPY     6      13
RCHRES   1                           1     RCHRES   2       8
RCHRES   3                           1     RCHRES   4       8
RCHRES   5                           1     RCHRES   6       8
RCHRES   7                           1     RCHRES   8       8
RCHRES   9                           1     RCHRES  10       8
RCHRES  11                           1     RCHRES  12       8
RCHRES  13                           1     RCHRES  14       8
RCHRES  15                           1     RCHRES  16       8
RCHRES  17                           1     RCHRES  18       8
RCHRES  19                           1     RCHRES  20       8
```

```
RCHRES  21                          1     RCHRES  22      8
RCHRES   2                          1     COPY   501     17
RCHRES   1                          1     COPY   501     17
RCHRES   4                          1     COPY   502     17
RCHRES   3                          1     COPY   502     17
RCHRES   6                          1     COPY   502     17
RCHRES   5                          1     COPY   502     17
RCHRES   8                          1     COPY   502     17
RCHRES   7                          1     COPY   502     17
RCHRES  10                          1     COPY   502     17
RCHRES   9                          1     COPY   502     17
RCHRES  12                          1     COPY   503     17
RCHRES  11                          1     COPY   503     17
RCHRES  14                          1     COPY   504     17
RCHRES  13                          1     COPY   504     17
RCHRES  16                          1     COPY   504     17
RCHRES  15                          1     COPY   504     17
RCHRES  18                          1     COPY   504     17
RCHRES  17                          1     COPY   504     17
RCHRES  20                          1     COPY   505     17
RCHRES  19                          1     COPY   505     17
RCHRES  22                          1     COPY   506     17
RCHRES  21                          1     COPY   506     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1
COPY   502 OUTPUT MEAN   1 1   12.1        DISPLY   2     INPUT  TIMSER 1
COPY   503 OUTPUT MEAN   1 1   12.1        DISPLY   3     INPUT  TIMSER 1
COPY   504 OUTPUT MEAN   1 1   12.1        DISPLY   4     INPUT  TIMSER 1
COPY   505 OUTPUT MEAN   1 1   12.1        DISPLY   5     INPUT  TIMSER 1
COPY   506 OUTPUT MEAN   1 1   12.1        DISPLY   6     INPUT  TIMSER 1
GENER    2 OUTPUT TIMSER      .0002778     RCHRES   1     EXTNL  OUTDGT 1
GENER    4 OUTPUT TIMSER      .0002778     RCHRES   3     EXTNL  OUTDGT 1
GENER    6 OUTPUT TIMSER      .0002778     RCHRES   5     EXTNL  OUTDGT 1
GENER    8 OUTPUT TIMSER      .0002778     RCHRES   7     EXTNL  OUTDGT 1
GENER   10 OUTPUT TIMSER      .0002778     RCHRES   9     EXTNL  OUTDGT 1
GENER   12 OUTPUT TIMSER      .0002778     RCHRES  11     EXTNL  OUTDGT 1
GENER   14 OUTPUT TIMSER      .0002778     RCHRES  13     EXTNL  OUTDGT 1
GENER   16 OUTPUT TIMSER      .0002778     RCHRES  15     EXTNL  OUTDGT 1
GENER   18 OUTPUT TIMSER      .0002778     RCHRES  17     EXTNL  OUTDGT 1
GENER   20 OUTPUT TIMSER      .0002778     RCHRES  19     EXTNL  OUTDGT 1
GENER   22 OUTPUT TIMSER      .0002778     RCHRES  21     EXTNL  OUTDGT 1


<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                         in  out                              ***
    1     Surface retentio-040    3    1    1    1   28    0    1
    2     Bioretention  1         2    1    1    1   28    0    1
    3     Surface retentio-042    3    1    1    1   28    0    1
    4     Bioretention  2         2    1    1    1   28    0    1
    5     Surface retentio-044    3    1    1    1   28    0    1
    6     Bioretention  3         2    1    1    1   28    0    1
    7     Surface retentio-046    3    1    1    1   28    0    1
    8     Bioretention  4         2    1    1    1   28    0    1
    9     Surface retentio-048    3    1    1    1   28    0    1
   10     Bioretention  5         2    1    1    1   28    0    1
   11     Surface retentio-050    3    1    1    1   28    0    1
   12     Bioretention  6         2    1    1    1   28    0    1
   13     Surface retentio-052    3    1    1    1   28    0    1
```

```
 14     Bioretention  7         2    1    1    1   28    0    1
 15     Surface retentio-054    3    1    1    1   28    0    1
 16     Bioretention  8         2    1    1    1   28    0    1
 17     Surface retentio-056    3    1    1    1   28    0    1
 18     Bioretention  9         2    1    1    1   28    0    1
 19     Surface etention-058    3    1    1    1   28    0    1
 20     Bioretention  10-057    2    1    1    1   28    0    1
 21     Surface etention-060    3    1    1    1   28    0    1
 22     Bioretention  11-059    2    1    1    1   28    0    1
END GEN-INFO
*** Section RCHRES***

ACTIVITY
  <PLS > ************* Active Sections ****************************
  # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  1         1    0    0    0    0    0    0    0    0    0
  2         1    0    0    0    0    0    0    0    0    0
  3         1    0    0    0    0    0    0    0    0    0
  4         1    0    0    0    0    0    0    0    0    0
  5         1    0    0    0    0    0    0    0    0    0
  6         1    0    0    0    0    0    0    0    0    0
  7         1    0    0    0    0    0    0    0    0    0
  8         1    0    0    0    0    0    0    0    0    0
  9         1    0    0    0    0    0    0    0    0    0
 10         1    0    0    0    0    0    0    0    0    0
 11         1    0    0    0    0    0    0    0    0    0
 12         1    0    0    0    0    0    0    0    0    0
 13         1    0    0    0    0    0    0    0    0    0
 14         1    0    0    0    0    0    0    0    0    0
 15         1    0    0    0    0    0    0    0    0    0
 16         1    0    0    0    0    0    0    0    0    0
 17         1    0    0    0    0    0    0    0    0    0
 18         1    0    0    0    0    0    0    0    0    0
 19         1    0    0    0    0    0    0    0    0    0
 20         1    0    0    0    0    0    0    0    0    0
 21         1    0    0    0    0    0    0    0    0    0
 22         1    0    0    0    0    0    0    0    0    0
END ACTIVITY

PRINT-INFO
  <PLS > ***************** Print-flags ******************* PIVL  PYR
  # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  1         4    0    0    0    0    0    0    0    0    0    1    9
  2         4    0    0    0    0    0    0    0    0    0    1    9
  3         4    0    0    0    0    0    0    0    0    0    1    9
  4         4    0    0    0    0    0    0    0    0    0    1    9
  5         4    0    0    0    0    0    0    0    0    0    1    9
  6         4    0    0    0    0    0    0    0    0    0    1    9
  7         4    0    0    0    0    0    0    0    0    0    1    9
  8         4    0    0    0    0    0    0    0    0    0    1    9
  9         4    0    0    0    0    0    0    0    0    0    1    9
 10         4    0    0    0    0    0    0    0    0    0    1    9
 11         4    0    0    0    0    0    0    0    0    0    1    9
 12         4    0    0    0    0    0    0    0    0    0    1    9
 13         4    0    0    0    0    0    0    0    0    0    1    9
 14         4    0    0    0    0    0    0    0    0    0    1    9
 15         4    0    0    0    0    0    0    0    0    0    1    9
 16         4    0    0    0    0    0    0    0    0    0    1    9
 17         4    0    0    0    0    0    0    0    0    0    1    9
 18         4    0    0    0    0    0    0    0    0    0    1    9
 19         4    0    0    0    0    0    0    0    0    0    1    9
 20         4    0    0    0    0    0    0    0    0    0    1    9
 21         4    0    0    0    0    0    0    0    0    0    1    9
 22         4    0    0    0    0    0    0    0    0    0    1    9
END PRINT-INFO

HYDR-PARM1
  RCHRES  Flags for each HYDR Section                                    ***
  # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
          FG FG FG FG  possible  exit  *** possible  exit      possible  exit
```

```
            *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  1         0  1  0  0    4  5  6  0  0       0  1  0  0  0        2  1  2  2  2
  2         0  1  0  0    4  5  0  0  0       0  0  0  0  0        2  2  2  2  2
  3         0  1  0  0    4  5  6  0  0       0  1  0  0  0        2  1  2  2  2
  4         0  1  0  0    4  5  0  0  0       0  0  0  0  0        2  2  2  2  2
  5         0  1  0  0    4  5  6  0  0       0  1  0  0  0        2  1  2  2  2
  6         0  1  0  0    4  5  0  0  0       0  0  0  0  0        2  2  2  2  2
  7         0  1  0  0    4  5  6  0  0       0  1  0  0  0        2  1  2  2  2
  8         0  1  0  0    4  5  0  0  0       0  0  0  0  0        2  2  2  2  2
  9         0  1  0  0    4  5  6  0  0       0  1  0  0  0        2  1  2  2  2
 10         0  1  0  0    4  5  0  0  0       0  0  0  0  0        2  2  2  2  2
 11         0  1  0  0    4  5  6  0  0       0  1  0  0  0        2  1  2  2  2
 12         0  1  0  0    4  5  0  0  0       0  0  0  0  0        2  2  2  2  2
 13         0  1  0  0    4  5  6  0  0       0  1  0  0  0        2  1  2  2  2
 14         0  1  0  0    4  5  0  0  0       0  0  0  0  0        2  2  2  2  2
 15         0  1  0  0    4  5  6  0  0       0  1  0  0  0        2  1  2  2  2
 16         0  1  0  0    4  5  0  0  0       0  0  0  0  0        2  2  2  2  2
 17         0  1  0  0    4  5  6  0  0       0  1  0  0  0        2  1  2  2  2
 18         0  1  0  0    4  5  0  0  0       0  0  0  0  0        2  2  2  2  2
 19         0  1  0  0    4  5  6  0  0       0  1  0  0  0        2  1  2  2  2
 20         0  1  0  0    4  5  0  0  0       0  0  0  0  0        2  2  2  2  2
 21         0  1  0  0    4  5  6  0  0       0  1  0  0  0        2  1  2  2  2
 22         0  1  0  0    4  5  0  0  0       0  0  0  0  0        2  2  2  2  2
END HYDR-PARM1

HYDR-PARM2
  # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
<------><--------><--------><--------><--------><--------><-------->       ***
  1              1      0.01       0.0       0.0       0.5       0.0
  2              2      0.05       0.0       0.0       0.5       0.0
  3              3      0.01       0.0       0.0       0.5       0.0
  4              4      0.01       0.0       0.0       0.5       0.0
  5              5      0.01       0.0       0.0       0.5       0.0
  6              6      0.01       0.0       0.0       0.5       0.0
  7              7      0.01       0.0       0.0       0.5       0.0
  8              8      0.02       0.0       0.0       0.5       0.0
  9              9      0.01       0.0       0.0       0.5       0.0
 10             10      0.02       0.0       0.0       0.5       0.0
 11             11      0.01       0.0       0.0       0.5       0.0
 12             12      0.01       0.0       0.0       0.5       0.0
 13             13      0.01       0.0       0.0       0.5       0.0
 14             14      0.01       0.0       0.0       0.5       0.0
 15             15      0.01       0.0       0.0       0.5       0.0
 16             16      0.01       0.0       0.0       0.5       0.0
 17             17      0.01       0.0       0.0       0.5       0.0
 18             18      0.03       0.0       0.0       0.5       0.0
 19             19      0.01       0.0       0.0       0.5       0.0
 20             20      0.05       0.0       0.0       0.5       0.0
 21             21      0.01       0.0       0.0       0.5       0.0
 22             22      0.09       0.0       0.0       0.5       0.0
END HYDR-PARM2
HYDR-INIT
  RCHRES  Initial conditions for each HYDR section                         ***
  # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
        *** ac-ft     for each possible exit        for each possible exit
<------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  1            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  2            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  3            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  4            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  5            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  6            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  7            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  8            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  9            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
 10         0            4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
 11         0            4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
 12         0            4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
 13         0            4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
 14         0            4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
```

```
   15         0            4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   16         0            4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   17         0            4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   18         0            4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   19         0            4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   20         0            4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   21         0            4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   22         0            4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol2   RCHRES   2 VOL              4
  UVQUAN v2m2   GLOBAL     WORKSP  1        3
  UVQUAN vpo2   GLOBAL     WORKSP  2        3
  UVQUAN v2d2   GENER    2 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol4   RCHRES   4 VOL              4
  UVQUAN v2m4   GLOBAL     WORKSP  3        3
  UVQUAN vpo4   GLOBAL     WORKSP  4        3
  UVQUAN v2d4   GENER    4 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol6   RCHRES   6 VOL              4
  UVQUAN v2m6   GLOBAL     WORKSP  5        3
  UVQUAN vpo6   GLOBAL     WORKSP  6        3
  UVQUAN v2d6   GENER    6 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol8   RCHRES   8 VOL              4
  UVQUAN v2m8   GLOBAL     WORKSP  7        3
  UVQUAN vpo8   GLOBAL     WORKSP  8        3
  UVQUAN v2d8   GENER    8 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol10  RCHRES  10 VOL              4
  UVQUAN v2m10  GLOBAL     WORKSP  9        3
  UVQUAN vpo10  GLOBAL     WORKSP 10        3
  UVQUAN v2d10  GENER   10 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol12  RCHRES  12 VOL              4
  UVQUAN v2m12  GLOBAL     WORKSP 11        3
  UVQUAN vpo12  GLOBAL     WORKSP 12        3
  UVQUAN v2d12  GENER   12 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
```

```
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol14  RCHRES  14 VOL              4
  UVQUAN v2m14  GLOBAL     WORKSP 13        3
  UVQUAN vpo14  GLOBAL     WORKSP 14        3
  UVQUAN v2d14  GENER   14 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                        <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol16  RCHRES  16 VOL              4
  UVQUAN v2m16  GLOBAL     WORKSP 15        3
  UVQUAN vpo16  GLOBAL     WORKSP 16        3
  UVQUAN v2d16  GENER   16 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                        <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol18  RCHRES  18 VOL              4
  UVQUAN v2m18  GLOBAL     WORKSP 17        3
  UVQUAN vpo18  GLOBAL     WORKSP 18        3
  UVQUAN v2d18  GENER   18 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                        <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol20  RCHRES  20 VOL              4
  UVQUAN v2m20  GLOBAL     WORKSP 19        3
  UVQUAN vpo20  GLOBAL     WORKSP 20        3
  UVQUAN v2d20  GENER   20 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                        <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol22  RCHRES  22 VOL              4
  UVQUAN v2m22  GLOBAL     WORKSP 21        3
  UVQUAN vpo22  GLOBAL     WORKSP 22        3
  UVQUAN v2d22  GENER   22 K       1        3
*** User-Defined Target Variable Names
***                  addr or                       addr or
***                 <------>                      <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m2    1 WORKSP  1         1.0 QUAN
  UVNAME  vpo2    1 WORKSP  2         1.0 QUAN
  UVNAME  v2d2    1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                  addr or                       addr or
***                 <------>                      <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m4    1 WORKSP  3         1.0 QUAN
  UVNAME  vpo4    1 WORKSP  4         1.0 QUAN
  UVNAME  v2d4    1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                  addr or                       addr or
***                 <------>                      <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m6    1 WORKSP  5         1.0 QUAN
  UVNAME  vpo6    1 WORKSP  6         1.0 QUAN
  UVNAME  v2d6    1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                  addr or                       addr or
***                 <------>                      <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
```

```
  UVNAME  v2m8    1 WORKSP  7         1.0 QUAN
  UVNAME  vpo8    1 WORKSP  8         1.0 QUAN
  UVNAME  v2d8    1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                  addr or                        addr or
***                 <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m10   1 WORKSP  9         1.0 QUAN
  UVNAME  vpo10   1 WORKSP 10         1.0 QUAN
  UVNAME  v2d10   1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                  addr or                        addr or
***                 <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m12   1 WORKSP 11         1.0 QUAN
  UVNAME  vpo12   1 WORKSP 12         1.0 QUAN
  UVNAME  v2d12   1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                  addr or                        addr or
***                 <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m14   1 WORKSP 13         1.0 QUAN
  UVNAME  vpo14   1 WORKSP 14         1.0 QUAN
  UVNAME  v2d14   1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                  addr or                        addr or
***                 <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m16   1 WORKSP 15         1.0 QUAN
  UVNAME  vpo16   1 WORKSP 16         1.0 QUAN
  UVNAME  v2d16   1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                  addr or                        addr or
***                 <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m18   1 WORKSP 17         1.0 QUAN
  UVNAME  vpo18   1 WORKSP 18         1.0 QUAN
  UVNAME  v2d18   1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                  addr or                        addr or
***                 <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m20   1 WORKSP 19         1.0 QUAN
  UVNAME  vpo20   1 WORKSP 20         1.0 QUAN
  UVNAME  v2d20   1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                  addr or                        addr or
***                 <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m22   1 WORKSP 21         1.0 QUAN
  UVNAME  vpo22   1 WORKSP 22         1.0 QUAN
  UVNAME  v2d22   1 K       1         1.0 QUAN
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   2                               v2m2            =  1596.
*** Compute remaining available pore space
  GENER   2                               vpo2            =  v2m2
  GENER   2                               vpo2           -=  vol2
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo2 < 0.0) THEN
  GENER   2                               vpo2            =  0.0
END IF
*** Infiltration volume
```

```
  GENER   2                                v2d2            =  vpo2
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   4                                v2m4            =  242.
*** Compute remaining available pore space
  GENER   4                                vpo4            =  v2m4
  GENER   4                                vpo4           -=  vol4
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo4 < 0.0) THEN
  GENER   4                                vpo4            =  0.0
END IF
*** Infiltration volume
  GENER   4                                v2d4            =  vpo4
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   6                                v2m6            =  555.
*** Compute remaining available pore space
  GENER   6                                vpo6            =  v2m6
  GENER   6                                vpo6           -=  vol6
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo6 < 0.0) THEN
  GENER   6                                vpo6            =  0.0
END IF
*** Infiltration volume
  GENER   6                                v2d6            =  vpo6
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   8                                v2m8            =  1330.
*** Compute remaining available pore space
  GENER   8                                vpo8            =  v2m8
  GENER   8                                vpo8           -=  vol8
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo8 < 0.0) THEN
  GENER   8                                vpo8            =  0.0
END IF
*** Infiltration volume
  GENER   8                                v2d8            =  vpo8
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER  10                                v2m10           =  757.
*** Compute remaining available pore space
  GENER  10                                vpo10           =  v2m10
  GENER  10                                vpo10          -=  vol10
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo10 < 0.0) THEN
  GENER  10                                vpo10           =  0.0
END IF
*** Infiltration volume
  GENER  10                                v2d10           =  vpo10
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER  12                                v2m12           =  547.
*** Compute remaining available pore space
  GENER  12                                vpo12           =  v2m12
  GENER  12                                vpo12          -=  vol12
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo12 < 0.0) THEN
  GENER  12                                vpo12           =  0.0
END IF
*** Infiltration volume
  GENER  12                                v2d12           =  vpo12
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER  14                                v2m14           =  829.
*** Compute remaining available pore space
  GENER  14                                vpo14           =  v2m14
  GENER  14                                vpo14          -=  vol14
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo14 < 0.0) THEN
  GENER  14                                vpo14           =  0.0
```

```
END IF
*** Infiltration volume
  GENER  14                                v2d14           =  vpo14
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><-><--------> <> <-><->
  GENER  16                                v2m16           =  579.
*** Compute remaining available pore space
  GENER  16                                vpo16           =  v2m16
  GENER  16                                vpo16          -=  vol16
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo16 < 0.0) THEN
  GENER  16                                vpo16           =  0.0
END IF
*** Infiltration volume
  GENER  16                                v2d16           =  vpo16
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><-><--------> <> <-><->
  GENER  18                                v2m18           =  1299.
*** Compute remaining available pore space
  GENER  18                                vpo18           =  v2m18
  GENER  18                                vpo18          -=  vol18
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo18 < 0.0) THEN
  GENER  18                                vpo18           =  0.0
END IF
*** Infiltration volume
  GENER  18                                v2d18           =  vpo18
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><-><--------> <> <-><->
  GENER  20                                v2m20           =  2167.
*** Compute remaining available pore space
  GENER  20                                vpo20           =  v2m20
  GENER  20                                vpo20          -=  vol20
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo20 < 0.0) THEN
  GENER  20                                vpo20           =  0.0
END IF
*** Infiltration volume
  GENER  20                                v2d20           =  vpo20
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><-><--------> <> <-><->
  GENER  22                                v2m22           =  7021.
*** Compute remaining available pore space
  GENER  22                                vpo22           =  v2m22
  GENER  22                                vpo22          -=  vol22
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo22 < 0.0) THEN
  GENER  22                                vpo22           =  0.0
END IF
*** Infiltration volume
  GENER  22                                v2d22           =  vpo22
END SPEC-ACTIONS
FTABLES
  FTABLE      2
   87    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.023416  0.000000  0.000000  0.000000
  0.046703  0.023416  0.000454  0.000000  0.000000
  0.093407  0.023416  0.000908  0.000000  0.001626
  0.140110  0.023416  0.001362  0.000000  0.003829
  0.186813  0.023416  0.001815  0.000000  0.007219
  0.233516  0.023416  0.002269  0.000000  0.011957
  0.280220  0.023416  0.002723  0.000000  0.015819
  0.326923  0.023416  0.003177  0.000000  0.015819
  0.373626  0.023416  0.003631  0.000000  0.015819
  0.420330  0.023416  0.004085  0.000000  0.015819
  0.467033  0.023416  0.004538  0.000000  0.015819
  0.513736  0.023416  0.004992  0.000000  0.015819
  0.560440  0.023416  0.005446  0.000000  0.015819
```

0.607143	0.023416	0.005900	0.000000	0.015819
0.653846	0.023416	0.006354	0.000000	0.015819
0.700549	0.023416	0.006808	0.000000	0.015819
0.747253	0.023416	0.007262	0.000000	0.015819
0.793956	0.023416	0.007715	0.000000	0.015819
0.840659	0.023416	0.008169	0.000000	0.015819
0.887363	0.023416	0.008623	0.000000	0.015819
0.934066	0.023416	0.009077	0.000000	0.015819
0.980769	0.023416	0.009531	0.000000	0.015819
1.027473	0.023416	0.009985	0.000000	0.015819
1.074176	0.023416	0.010438	0.000000	0.015819
1.120879	0.023416	0.010892	0.000000	0.015819
1.167582	0.023416	0.011346	0.000000	0.015819
1.214286	0.023416	0.011800	0.000000	0.015819
1.260989	0.023416	0.012254	0.000000	0.015819
1.307692	0.023416	0.012708	0.000000	0.015819
1.354396	0.023416	0.013162	0.000000	0.015819
1.401099	0.023416	0.013615	0.000000	0.015819
1.447802	0.023416	0.014069	0.000000	0.015819
1.494505	0.023416	0.014523	0.000000	0.015819
1.541209	0.023416	0.014977	0.000000	0.015819
1.587912	0.023416	0.015431	0.000000	0.015819
1.634615	0.023416	0.015885	0.000000	0.015819
1.681319	0.023416	0.016338	0.000000	0.015819
1.728022	0.023416	0.016792	0.000000	0.015819
1.774725	0.023416	0.017246	0.000000	0.015819
1.821429	0.023416	0.017700	0.000000	0.015819
1.868132	0.023416	0.018154	0.000000	0.015819
1.914835	0.023416	0.018608	0.000000	0.015819
1.961538	0.023416	0.019062	0.000000	0.015819
2.008242	0.023416	0.019515	0.000000	0.015819
2.054945	0.023416	0.019969	0.000000	0.015819
2.101648	0.023416	0.020423	0.000000	0.015819
2.148352	0.023416	0.020877	0.000000	0.015819
2.195055	0.023416	0.021331	0.000000	0.015819
2.241758	0.023416	0.021785	0.000000	0.015819
2.288462	0.023416	0.022238	0.000000	0.015819
2.335165	0.023416	0.022692	0.000000	0.015819
2.381868	0.023416	0.023146	0.000000	0.015819
2.428571	0.023416	0.023600	0.000000	0.015819
2.475275	0.023416	0.024054	0.000000	0.015819
2.521978	0.023416	0.024508	0.000000	0.015819
2.568681	0.023416	0.024961	0.000000	0.015819
2.615385	0.023416	0.025415	0.000000	0.015819
2.662088	0.023416	0.025869	0.000000	0.015819
2.708791	0.023416	0.026323	0.000000	0.015819
2.755495	0.023416	0.026777	0.000000	0.015819
2.802198	0.023416	0.027231	0.000000	0.015819
2.848901	0.023416	0.027685	0.000000	0.015819
2.895604	0.023416	0.028138	0.000000	0.015819
2.942308	0.023416	0.028592	0.000000	0.015819
2.989011	0.023416	0.029046	0.000000	0.015819
3.035714	0.023416	0.029500	0.000000	0.015819
3.082418	0.023416	0.029954	0.000000	0.015819
3.129121	0.023416	0.030408	0.000000	0.015819
3.175824	0.023416	0.030861	0.000000	0.015819
3.222527	0.023416	0.031315	0.000000	0.015819
3.269231	0.023416	0.031769	0.000000	0.015819
3.315934	0.023416	0.032223	0.000000	0.015819
3.362637	0.023416	0.032677	0.000000	0.015819
3.409341	0.023416	0.033131	0.000000	0.015819
3.456044	0.023416	0.033585	0.000000	0.015819
3.502747	0.023416	0.034038	0.000000	0.015819
3.549451	0.023416	0.034492	0.000000	0.015819
3.596154	0.023416	0.034946	0.000000	0.015819
3.642857	0.023416	0.035400	0.000000	0.015819
3.689560	0.023416	0.035854	0.000000	0.015819
3.736264	0.023416	0.036308	0.000000	0.015819
3.782967	0.023416	0.036761	0.000000	0.015819
3.829670	0.023416	0.037215	0.000000	0.015819

```
  3.876374  0.023416  0.037669  0.000000  0.015819
  3.923077  0.023416  0.038123  0.000000  0.015819
  3.969780  0.023416  0.038577  0.000000  0.015819
  4.000000  0.023416  0.081628  0.000000  0.015819
  END FTABLE  2
  FTABLE      1
    7    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.023416  0.000000  0.000000  0.000000  0.000000
  0.046703  0.023416  0.001094  0.053278  11.84936  0.000000
  0.093407  0.023416  0.002187  0.146034  11.98612  0.000000
  0.140110  0.023416  0.003281  0.247089  12.12287  0.000000
  0.186813  0.023416  0.004374  0.329316  12.25963  0.000000
  0.233516  0.023416  0.005468  0.378142  12.39638  0.000000
  0.250000  0.023416  0.005854  0.416820  12.44465  0.000000
  END FTABLE  1
  FTABLE      4
   87    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.003558  0.000000  0.000000  0.000000
  0.046703  0.003558  0.000069  0.000000  0.000000
  0.093407  0.003558  0.000138  0.000000  0.000247
  0.140110  0.003558  0.000207  0.000000  0.000582
  0.186813  0.003558  0.000276  0.000000  0.001097
  0.233516  0.003558  0.000345  0.000000  0.001817
  0.280220  0.003558  0.000414  0.000000  0.002404
  0.326923  0.003558  0.000483  0.000000  0.002404
  0.373626  0.003558  0.000552  0.000000  0.002404
  0.420330  0.003558  0.000621  0.000000  0.002404
  0.467033  0.003558  0.000690  0.000000  0.002404
  0.513736  0.003558  0.000759  0.000000  0.002404
  0.560440  0.003558  0.000828  0.000000  0.002404
  0.607143  0.003558  0.000897  0.000000  0.002404
  0.653846  0.003558  0.000966  0.000000  0.002404
  0.700549  0.003558  0.001035  0.000000  0.002404
  0.747253  0.003558  0.001103  0.000000  0.002404
  0.793956  0.003558  0.001172  0.000000  0.002404
  0.840659  0.003558  0.001241  0.000000  0.002404
  0.887363  0.003558  0.001310  0.000000  0.002404
  0.934066  0.003558  0.001379  0.000000  0.002404
  0.980769  0.003558  0.001448  0.000000  0.002404
  1.027473  0.003558  0.001517  0.000000  0.002404
  1.074176  0.003558  0.001586  0.000000  0.002404
  1.120879  0.003558  0.001655  0.000000  0.002404
  1.167582  0.003558  0.001724  0.000000  0.002404
  1.214286  0.003558  0.001793  0.000000  0.002404
  1.260989  0.003558  0.001862  0.000000  0.002404
  1.307692  0.003558  0.001931  0.000000  0.002404
  1.354396  0.003558  0.002000  0.000000  0.002404
  1.401099  0.003558  0.002069  0.000000  0.002404
  1.447802  0.003558  0.002138  0.000000  0.002404
  1.494505  0.003558  0.002207  0.000000  0.002404
  1.541209  0.003558  0.002276  0.000000  0.002404
  1.587912  0.003558  0.002345  0.000000  0.002404
  1.634615  0.003558  0.002414  0.000000  0.002404
  1.681319  0.003558  0.002483  0.000000  0.002404
  1.728022  0.003558  0.002552  0.000000  0.002404
  1.774725  0.003558  0.002621  0.000000  0.002404
  1.821429  0.003558  0.002690  0.000000  0.002404
  1.868132  0.003558  0.002759  0.000000  0.002404
  1.914835  0.003558  0.002828  0.000000  0.002404
  1.961538  0.003558  0.002897  0.000000  0.002404
  2.008242  0.003558  0.002966  0.000000  0.002404
  2.054945  0.003558  0.003035  0.000000  0.002404
  2.101648  0.003558  0.003104  0.000000  0.002404
  2.148352  0.003558  0.003172  0.000000  0.002404
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  2.195055  0.003558  0.003241  0.000000  0.002404
  2.241758  0.003558  0.003310  0.000000  0.002404
  2.288462  0.003558  0.003379  0.000000  0.002404
  2.335165  0.003558  0.003448  0.000000  0.002404
  2.381868  0.003558  0.003517  0.000000  0.002404
  2.428571  0.003558  0.003586  0.000000  0.002404
  2.475275  0.003558  0.003655  0.000000  0.002404
  2.521978  0.003558  0.003724  0.000000  0.002404
  2.568681  0.003558  0.003793  0.000000  0.002404
  2.615385  0.003558  0.003862  0.000000  0.002404
  2.662088  0.003558  0.003931  0.000000  0.002404
  2.708791  0.003558  0.004000  0.000000  0.002404
  2.755495  0.003558  0.004069  0.000000  0.002404
  2.802198  0.003558  0.004138  0.000000  0.002404
  2.848901  0.003558  0.004207  0.000000  0.002404
  2.895604  0.003558  0.004276  0.000000  0.002404
  2.942308  0.003558  0.004345  0.000000  0.002404
  2.989011  0.003558  0.004414  0.000000  0.002404
  3.035714  0.003558  0.004483  0.000000  0.002404
  3.082418  0.003558  0.004552  0.000000  0.002404
  3.129121  0.003558  0.004621  0.000000  0.002404
  3.175824  0.003558  0.004690  0.000000  0.002404
  3.222527  0.003558  0.004759  0.000000  0.002404
  3.269231  0.003558  0.004828  0.000000  0.002404
  3.315934  0.003558  0.004897  0.000000  0.002404
  3.362637  0.003558  0.004966  0.000000  0.002404
  3.409341  0.003558  0.005035  0.000000  0.002404
  3.456044  0.003558  0.005104  0.000000  0.002404
  3.502747  0.003558  0.005173  0.000000  0.002404
  3.549451  0.003558  0.005241  0.000000  0.002404
  3.596154  0.003558  0.005310  0.000000  0.002404
  3.642857  0.003558  0.005379  0.000000  0.002404
  3.689560  0.003558  0.005448  0.000000  0.002404
  3.736264  0.003558  0.005517  0.000000  0.002404
  3.782967  0.003558  0.005586  0.000000  0.002404
  3.829670  0.003558  0.005655  0.000000  0.002404
  3.876374  0.003558  0.005724  0.000000  0.002404
  3.923077  0.003558  0.005793  0.000000  0.002404
  3.969780  0.003558  0.005862  0.000000  0.002404
  4.000000  0.003558  0.012404  0.000000  0.002404
  END FTABLE  4
  FTABLE      3
    7    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.003558  0.000000  0.000000  0.000000  0.000000
  0.046703  0.003558  0.000166  0.106977  1.800638  0.000000
  0.093407  0.003558  0.000332  0.301385  1.821420  0.000000
  0.140110  0.003558  0.000499  0.547857  1.842201  0.000000
  0.186813  0.003558  0.000665  0.826090  1.862982  0.000000
  0.233516  0.003558  0.000831  1.116169  1.883764  0.000000
  0.250000  0.003558  0.000890  1.397744  1.891098  0.000000
  END FTABLE  3
  FTABLE      6
   87    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.008150  0.000000  0.000000  0.000000
  0.046703  0.008150  0.000158  0.000000  0.000000
  0.093407  0.008150  0.000316  0.000000  0.000566
  0.140110  0.008150  0.000474  0.000000  0.001333
  0.186813  0.008150  0.000632  0.000000  0.002512
  0.233516  0.008150  0.000790  0.000000  0.004162
  0.280220  0.008150  0.000948  0.000000  0.005506
  0.326923  0.008150  0.001106  0.000000  0.005506
  0.373626  0.008150  0.001264  0.000000  0.005506
  0.420330  0.008150  0.001422  0.000000  0.005506
  0.467033  0.008150  0.001580  0.000000  0.005506
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0.513736	0.008150	0.001738	0.000000	0.005506
0.560440	0.008150	0.001895	0.000000	0.005506
0.607143	0.008150	0.002053	0.000000	0.005506
0.653846	0.008150	0.002211	0.000000	0.005506
0.700549	0.008150	0.002369	0.000000	0.005506
0.747253	0.008150	0.002527	0.000000	0.005506
0.793956	0.008150	0.002685	0.000000	0.005506
0.840659	0.008150	0.002843	0.000000	0.005506
0.887363	0.008150	0.003001	0.000000	0.005506
0.934066	0.008150	0.003159	0.000000	0.005506
0.980769	0.008150	0.003317	0.000000	0.005506
1.027473	0.008150	0.003475	0.000000	0.005506
1.074176	0.008150	0.003633	0.000000	0.005506
1.120879	0.008150	0.003791	0.000000	0.005506
1.167582	0.008150	0.003949	0.000000	0.005506
1.214286	0.008150	0.004107	0.000000	0.005506
1.260989	0.008150	0.004265	0.000000	0.005506
1.307692	0.008150	0.004423	0.000000	0.005506
1.354396	0.008150	0.004581	0.000000	0.005506
1.401099	0.008150	0.004739	0.000000	0.005506
1.447802	0.008150	0.004897	0.000000	0.005506
1.494505	0.008150	0.005055	0.000000	0.005506
1.541209	0.008150	0.005213	0.000000	0.005506
1.587912	0.008150	0.005371	0.000000	0.005506
1.634615	0.008150	0.005528	0.000000	0.005506
1.681319	0.008150	0.005686	0.000000	0.005506
1.728022	0.008150	0.005844	0.000000	0.005506
1.774725	0.008150	0.006002	0.000000	0.005506
1.821429	0.008150	0.006160	0.000000	0.005506
1.868132	0.008150	0.006318	0.000000	0.005506
1.914835	0.008150	0.006476	0.000000	0.005506
1.961538	0.008150	0.006634	0.000000	0.005506
2.008242	0.008150	0.006792	0.000000	0.005506
2.054945	0.008150	0.006950	0.000000	0.005506
2.101648	0.008150	0.007108	0.000000	0.005506
2.148352	0.008150	0.007266	0.000000	0.005506
2.195055	0.008150	0.007424	0.000000	0.005506
2.241758	0.008150	0.007582	0.000000	0.005506
2.288462	0.008150	0.007740	0.000000	0.005506
2.335165	0.008150	0.007898	0.000000	0.005506
2.381868	0.008150	0.008056	0.000000	0.005506
2.428571	0.008150	0.008214	0.000000	0.005506
2.475275	0.008150	0.008372	0.000000	0.005506
2.521978	0.008150	0.008530	0.000000	0.005506
2.568681	0.008150	0.008688	0.000000	0.005506
2.615385	0.008150	0.008846	0.000000	0.005506
2.662088	0.008150	0.009003	0.000000	0.005506
2.708791	0.008150	0.009161	0.000000	0.005506
2.755495	0.008150	0.009319	0.000000	0.005506
2.802198	0.008150	0.009477	0.000000	0.005506
2.848901	0.008150	0.009635	0.000000	0.005506
2.895604	0.008150	0.009793	0.000000	0.005506
2.942308	0.008150	0.009951	0.000000	0.005506
2.989011	0.008150	0.010109	0.000000	0.005506
3.035714	0.008150	0.010267	0.000000	0.005506
3.082418	0.008150	0.010425	0.000000	0.005506
3.129121	0.008150	0.010583	0.000000	0.005506
3.175824	0.008150	0.010741	0.000000	0.005506
3.222527	0.008150	0.010899	0.000000	0.005506
3.269231	0.008150	0.011057	0.000000	0.005506
3.315934	0.008150	0.011215	0.000000	0.005506
3.362637	0.008150	0.011373	0.000000	0.005506
3.409341	0.008150	0.011531	0.000000	0.005506
3.456044	0.008150	0.011689	0.000000	0.005506
3.502747	0.008150	0.011847	0.000000	0.005506
3.549451	0.008150	0.012005	0.000000	0.005506
3.596154	0.008150	0.012163	0.000000	0.005506
3.642857	0.008150	0.012321	0.000000	0.005506
3.689560	0.008150	0.012479	0.000000	0.005506
3.736264	0.008150	0.012636	0.000000	0.005506

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  3.782967  0.008150  0.012794  0.000000  0.005506
  3.829670  0.008150  0.012952  0.000000  0.005506
  3.876374  0.008150  0.013110  0.000000  0.005506
  3.923077  0.008150  0.013268  0.000000  0.005506
  3.969780  0.008150  0.013426  0.000000  0.005506
  4.000000  0.008150  0.028410  0.000000  0.005506
  END FTABLE  6
  FTABLE      5
    7    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.008150  0.000000  0.000000  0.000000  0.000000
  0.046703  0.008150  0.000381  0.106977  4.124043  0.000000
  0.093407  0.008150  0.000761  0.301385  4.171639  0.000000
  0.140110  0.008150  0.001142  0.547857  4.219234  0.000000
  0.186813  0.008150  0.001522  0.826090  4.266830  0.000000
  0.233516  0.008150  0.001903  1.116169  4.314426  0.000000
  0.250000  0.008150  0.002037  1.397744  4.331225  0.000000
  END FTABLE  5
  FTABLE      8
   87    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.019513  0.000000  0.000000  0.000000
  0.046703  0.019513  0.000378  0.000000  0.000000
  0.093407  0.019513  0.000756  0.000000  0.001355
  0.140110  0.019513  0.001135  0.000000  0.003191
  0.186813  0.019513  0.001513  0.000000  0.006016
  0.233516  0.019513  0.001891  0.000000  0.009964
  0.280220  0.019513  0.002269  0.000000  0.013183
  0.326923  0.019513  0.002647  0.000000  0.013183
  0.373626  0.019513  0.003026  0.000000  0.013183
  0.420330  0.019513  0.003404  0.000000  0.013183
  0.467033  0.019513  0.003782  0.000000  0.013183
  0.513736  0.019513  0.004160  0.000000  0.013183
  0.560440  0.019513  0.004538  0.000000  0.013183
  0.607143  0.019513  0.004917  0.000000  0.013183
  0.653846  0.019513  0.005295  0.000000  0.013183
  0.700549  0.019513  0.005673  0.000000  0.013183
  0.747253  0.019513  0.006051  0.000000  0.013183
  0.793956  0.019513  0.006429  0.000000  0.013183
  0.840659  0.019513  0.006808  0.000000  0.013183
  0.887363  0.019513  0.007186  0.000000  0.013183
  0.934066  0.019513  0.007564  0.000000  0.013183
  0.980769  0.019513  0.007942  0.000000  0.013183
  1.027473  0.019513  0.008320  0.000000  0.013183
  1.074176  0.019513  0.008699  0.000000  0.013183
  1.120879  0.019513  0.009077  0.000000  0.013183
  1.167582  0.019513  0.009455  0.000000  0.013183
  1.214286  0.019513  0.009833  0.000000  0.013183
  1.260989  0.019513  0.010212  0.000000  0.013183
  1.307692  0.019513  0.010590  0.000000  0.013183
  1.354396  0.019513  0.010968  0.000000  0.013183
  1.401099  0.019513  0.011346  0.000000  0.013183
  1.447802  0.019513  0.011724  0.000000  0.013183
  1.494505  0.019513  0.012103  0.000000  0.013183
  1.541209  0.019513  0.012481  0.000000  0.013183
  1.587912  0.019513  0.012859  0.000000  0.013183
  1.634615  0.019513  0.013237  0.000000  0.013183
  1.681319  0.019513  0.013615  0.000000  0.013183
  1.728022  0.019513  0.013994  0.000000  0.013183
  1.774725  0.019513  0.014372  0.000000  0.013183
  1.821429  0.019513  0.014750  0.000000  0.013183
  1.868132  0.019513  0.015128  0.000000  0.013183
  1.914835  0.019513  0.015506  0.000000  0.013183
  1.961538  0.019513  0.015885  0.000000  0.013183
  2.008242  0.019513  0.016263  0.000000  0.013183
  2.054945  0.019513  0.016641  0.000000  0.013183
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  2.101648  0.019513  0.017019  0.000000  0.013183
  2.148352  0.019513  0.017397  0.000000  0.013183
  2.195055  0.019513  0.017776  0.000000  0.013183
  2.241758  0.019513  0.018154  0.000000  0.013183
  2.288462  0.019513  0.018532  0.000000  0.013183
  2.335165  0.019513  0.018910  0.000000  0.013183
  2.381868  0.019513  0.019288  0.000000  0.013183
  2.428571  0.019513  0.019667  0.000000  0.013183
  2.475275  0.019513  0.020045  0.000000  0.013183
  2.521978  0.019513  0.020423  0.000000  0.013183
  2.568681  0.019513  0.020801  0.000000  0.013183
  2.615385  0.019513  0.021179  0.000000  0.013183
  2.662088  0.019513  0.021558  0.000000  0.013183
  2.708791  0.019513  0.021936  0.000000  0.013183
  2.755495  0.019513  0.022314  0.000000  0.013183
  2.802198  0.019513  0.022692  0.000000  0.013183
  2.848901  0.019513  0.023070  0.000000  0.013183
  2.895604  0.019513  0.023449  0.000000  0.013183
  2.942308  0.019513  0.023827  0.000000  0.013183
  2.989011  0.019513  0.024205  0.000000  0.013183
  3.035714  0.019513  0.024583  0.000000  0.013183
  3.082418  0.019513  0.024961  0.000000  0.013183
  3.129121  0.019513  0.025340  0.000000  0.013183
  3.175824  0.019513  0.025718  0.000000  0.013183
  3.222527  0.019513  0.026096  0.000000  0.013183
  3.269231  0.019513  0.026474  0.000000  0.013183
  3.315934  0.019513  0.026853  0.000000  0.013183
  3.362637  0.019513  0.027231  0.000000  0.013183
  3.409341  0.019513  0.027609  0.000000  0.013183
  3.456044  0.019513  0.027987  0.000000  0.013183
  3.502747  0.019513  0.028365  0.000000  0.013183
  3.549451  0.019513  0.028744  0.000000  0.013183
  3.596154  0.019513  0.029122  0.000000  0.013183
  3.642857  0.019513  0.029500  0.000000  0.013183
  3.689560  0.019513  0.029878  0.000000  0.013183
  3.736264  0.019513  0.030256  0.000000  0.013183
  3.782967  0.019513  0.030635  0.000000  0.013183
  3.829670  0.019513  0.031013  0.000000  0.013183
  3.876374  0.019513  0.031391  0.000000  0.013183
  3.923077  0.019513  0.031769  0.000000  0.013183
  3.969780  0.019513  0.032147  0.000000  0.013183
  4.000000  0.019513  0.068023  0.000000  0.013183
  END FTABLE  8
  FTABLE      7
    7    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.019513  0.000000  0.000000  0.000000  0.000000
  0.046703  0.019513  0.000911  0.106977  9.874468  0.000000
  0.093407  0.019513  0.001823  0.301385  9.988430  0.000000
  0.140110  0.019513  0.002734  0.547857  10.10239  0.000000
  0.186813  0.019513  0.003645  0.826090  10.21635  0.000000
  0.233516  0.019513  0.004557  1.116169  10.33032  0.000000
  0.250000  0.019513  0.004878  1.397744  10.37054  0.000000
  END FTABLE  7
  FTABLE     10
   87    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.011111  0.000000  0.000000  0.000000
  0.046703  0.011111  0.000215  0.000000  0.000000
  0.093407  0.011111  0.000431  0.000000  0.000771
  0.140110  0.011111  0.000646  0.000000  0.001817
  0.186813  0.011111  0.000861  0.000000  0.003425
  0.233516  0.011111  0.001077  0.000000  0.005674
  0.280220  0.011111  0.001292  0.000000  0.007506
  0.326923  0.011111  0.001507  0.000000  0.007506
  0.373626  0.011111  0.001723  0.000000  0.007506
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0.420330	0.011111	0.001938	0.000000	0.007506
0.467033	0.011111	0.002154	0.000000	0.007506
0.513736	0.011111	0.002369	0.000000	0.007506
0.560440	0.011111	0.002584	0.000000	0.007506
0.607143	0.011111	0.002800	0.000000	0.007506
0.653846	0.011111	0.003015	0.000000	0.007506
0.700549	0.011111	0.003230	0.000000	0.007506
0.747253	0.011111	0.003446	0.000000	0.007506
0.793956	0.011111	0.003661	0.000000	0.007506
0.840659	0.011111	0.003876	0.000000	0.007506
0.887363	0.011111	0.004092	0.000000	0.007506
0.934066	0.011111	0.004307	0.000000	0.007506
0.980769	0.011111	0.004522	0.000000	0.007506
1.027473	0.011111	0.004738	0.000000	0.007506
1.074176	0.011111	0.004953	0.000000	0.007506
1.120879	0.011111	0.005168	0.000000	0.007506
1.167582	0.011111	0.005384	0.000000	0.007506
1.214286	0.011111	0.005599	0.000000	0.007506
1.260989	0.011111	0.005815	0.000000	0.007506
1.307692	0.011111	0.006030	0.000000	0.007506
1.354396	0.011111	0.006245	0.000000	0.007506
1.401099	0.011111	0.006461	0.000000	0.007506
1.447802	0.011111	0.006676	0.000000	0.007506
1.494505	0.011111	0.006891	0.000000	0.007506
1.541209	0.011111	0.007107	0.000000	0.007506
1.587912	0.011111	0.007322	0.000000	0.007506
1.634615	0.011111	0.007537	0.000000	0.007506
1.681319	0.011111	0.007753	0.000000	0.007506
1.728022	0.011111	0.007968	0.000000	0.007506
1.774725	0.011111	0.008183	0.000000	0.007506
1.821429	0.011111	0.008399	0.000000	0.007506
1.868132	0.011111	0.008614	0.000000	0.007506
1.914835	0.011111	0.008830	0.000000	0.007506
1.961538	0.011111	0.009045	0.000000	0.007506
2.008242	0.011111	0.009260	0.000000	0.007506
2.054945	0.011111	0.009476	0.000000	0.007506
2.101648	0.011111	0.009691	0.000000	0.007506
2.148352	0.011111	0.009906	0.000000	0.007506
2.195055	0.011111	0.010122	0.000000	0.007506
2.241758	0.011111	0.010337	0.000000	0.007506
2.288462	0.011111	0.010552	0.000000	0.007506
2.335165	0.011111	0.010768	0.000000	0.007506
2.381868	0.011111	0.010983	0.000000	0.007506
2.428571	0.011111	0.011198	0.000000	0.007506
2.475275	0.011111	0.011414	0.000000	0.007506
2.521978	0.011111	0.011629	0.000000	0.007506
2.568681	0.011111	0.011844	0.000000	0.007506
2.615385	0.011111	0.012060	0.000000	0.007506
2.662088	0.011111	0.012275	0.000000	0.007506
2.708791	0.011111	0.012491	0.000000	0.007506
2.755495	0.011111	0.012706	0.000000	0.007506
2.802198	0.011111	0.012921	0.000000	0.007506
2.848901	0.011111	0.013137	0.000000	0.007506
2.895604	0.011111	0.013352	0.000000	0.007506
2.942308	0.011111	0.013567	0.000000	0.007506
2.989011	0.011111	0.013783	0.000000	0.007506
3.035714	0.011111	0.013998	0.000000	0.007506
3.082418	0.011111	0.014213	0.000000	0.007506
3.129121	0.011111	0.014429	0.000000	0.007506
3.175824	0.011111	0.014644	0.000000	0.007506
3.222527	0.011111	0.014859	0.000000	0.007506
3.269231	0.011111	0.015075	0.000000	0.007506
3.315934	0.011111	0.015290	0.000000	0.007506
3.362637	0.011111	0.015505	0.000000	0.007506
3.409341	0.011111	0.015721	0.000000	0.007506
3.456044	0.011111	0.015936	0.000000	0.007506
3.502747	0.011111	0.016152	0.000000	0.007506
3.549451	0.011111	0.016367	0.000000	0.007506
3.596154	0.011111	0.016582	0.000000	0.007506
3.642857	0.011111	0.016798	0.000000	0.007506

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  3.689560  0.011111  0.017013  0.000000  0.007506
  3.736264  0.011111  0.017228  0.000000  0.007506
  3.782967  0.011111  0.017444  0.000000  0.007506
  3.829670  0.011111  0.017659  0.000000  0.007506
  3.876374  0.011111  0.017874  0.000000  0.007506
  3.923077  0.011111  0.018090  0.000000  0.007506
  3.969780  0.011111  0.018305  0.000000  0.007506
  4.000000  0.011111  0.038733  0.000000  0.007506
  END FTABLE 10
  FTABLE      9
    7    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.011111  0.000000  0.000000  0.000000  0.000000
  0.046703  0.011111  0.000519  0.106977  5.622639  0.000000
  0.093407  0.011111  0.001038  0.301385  5.687530  0.000000
  0.140110  0.011111  0.001557  0.547857  5.752421  0.000000
  0.186813  0.011111  0.002076  0.826090  5.817312  0.000000
  0.233516  0.011111  0.002595  1.116169  5.882204  0.000000
  0.250000  0.011111  0.002778  1.397744  5.905106  0.000000
  END FTABLE  9
  FTABLE     12
   87    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.008035  0.000000  0.000000  0.000000
  0.046703  0.008035  0.000156  0.000000  0.000000
  0.093407  0.008035  0.000311  0.000000  0.000558
  0.140110  0.008035  0.000467  0.000000  0.001314
  0.186813  0.008035  0.000623  0.000000  0.002477
  0.233516  0.008035  0.000779  0.000000  0.004103
  0.280220  0.008035  0.000934  0.000000  0.005428
  0.326923  0.008035  0.001090  0.000000  0.005428
  0.373626  0.008035  0.001246  0.000000  0.005428
  0.420330  0.008035  0.001402  0.000000  0.005428
  0.467033  0.008035  0.001557  0.000000  0.005428
  0.513736  0.008035  0.001713  0.000000  0.005428
  0.560440  0.008035  0.001869  0.000000  0.005428
  0.607143  0.008035  0.002025  0.000000  0.005428
  0.653846  0.008035  0.002180  0.000000  0.005428
  0.700549  0.008035  0.002336  0.000000  0.005428
  0.747253  0.008035  0.002492  0.000000  0.005428
  0.793956  0.008035  0.002647  0.000000  0.005428
  0.840659  0.008035  0.002803  0.000000  0.005428
  0.887363  0.008035  0.002959  0.000000  0.005428
  0.934066  0.008035  0.003115  0.000000  0.005428
  0.980769  0.008035  0.003270  0.000000  0.005428
  1.027473  0.008035  0.003426  0.000000  0.005428
  1.074176  0.008035  0.003582  0.000000  0.005428
  1.120879  0.008035  0.003738  0.000000  0.005428
  1.167582  0.008035  0.003893  0.000000  0.005428
  1.214286  0.008035  0.004049  0.000000  0.005428
  1.260989  0.008035  0.004205  0.000000  0.005428
  1.307692  0.008035  0.004360  0.000000  0.005428
  1.354396  0.008035  0.004516  0.000000  0.005428
  1.401099  0.008035  0.004672  0.000000  0.005428
  1.447802  0.008035  0.004828  0.000000  0.005428
  1.494505  0.008035  0.004983  0.000000  0.005428
  1.541209  0.008035  0.005139  0.000000  0.005428
  1.587912  0.008035  0.005295  0.000000  0.005428
  1.634615  0.008035  0.005451  0.000000  0.005428
  1.681319  0.008035  0.005606  0.000000  0.005428
  1.728022  0.008035  0.005762  0.000000  0.005428
  1.774725  0.008035  0.005918  0.000000  0.005428
  1.821429  0.008035  0.006074  0.000000  0.005428
  1.868132  0.008035  0.006229  0.000000  0.005428
  1.914835  0.008035  0.006385  0.000000  0.005428
  1.961538  0.008035  0.006541  0.000000  0.005428
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  2.008242  0.008035  0.006696  0.000000  0.005428
  2.054945  0.008035  0.006852  0.000000  0.005428
  2.101648  0.008035  0.007008  0.000000  0.005428
  2.148352  0.008035  0.007164  0.000000  0.005428
  2.195055  0.008035  0.007319  0.000000  0.005428
  2.241758  0.008035  0.007475  0.000000  0.005428
  2.288462  0.008035  0.007631  0.000000  0.005428
  2.335165  0.008035  0.007787  0.000000  0.005428
  2.381868  0.008035  0.007942  0.000000  0.005428
  2.428571  0.008035  0.008098  0.000000  0.005428
  2.475275  0.008035  0.008254  0.000000  0.005428
  2.521978  0.008035  0.008409  0.000000  0.005428
  2.568681  0.008035  0.008565  0.000000  0.005428
  2.615385  0.008035  0.008721  0.000000  0.005428
  2.662088  0.008035  0.008877  0.000000  0.005428
  2.708791  0.008035  0.009032  0.000000  0.005428
  2.755495  0.008035  0.009188  0.000000  0.005428
  2.802198  0.008035  0.009344  0.000000  0.005428
  2.848901  0.008035  0.009500  0.000000  0.005428
  2.895604  0.008035  0.009655  0.000000  0.005428
  2.942308  0.008035  0.009811  0.000000  0.005428
  2.989011  0.008035  0.009967  0.000000  0.005428
  3.035714  0.008035  0.010123  0.000000  0.005428
  3.082418  0.008035  0.010278  0.000000  0.005428
  3.129121  0.008035  0.010434  0.000000  0.005428
  3.175824  0.008035  0.010590  0.000000  0.005428
  3.222527  0.008035  0.010745  0.000000  0.005428
  3.269231  0.008035  0.010901  0.000000  0.005428
  3.315934  0.008035  0.011057  0.000000  0.005428
  3.362637  0.008035  0.011213  0.000000  0.005428
  3.409341  0.008035  0.011368  0.000000  0.005428
  3.456044  0.008035  0.011524  0.000000  0.005428
  3.502747  0.008035  0.011680  0.000000  0.005428
  3.549451  0.008035  0.011836  0.000000  0.005428
  3.596154  0.008035  0.011991  0.000000  0.005428
  3.642857  0.008035  0.012147  0.000000  0.005428
  3.689560  0.008035  0.012303  0.000000  0.005428
  3.736264  0.008035  0.012459  0.000000  0.005428
  3.782967  0.008035  0.012614  0.000000  0.005428
  3.829670  0.008035  0.012770  0.000000  0.005428
  3.876374  0.008035  0.012926  0.000000  0.005428
  3.923077  0.008035  0.013081  0.000000  0.005428
  3.969780  0.008035  0.013237  0.000000  0.005428
  4.000000  0.008035  0.028010  0.000000  0.005428
  END FTABLE 12
  FTABLE     11
    7    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.008035  0.000000  0.000000  0.000000  0.000000
  0.046703  0.008035  0.000375  0.053278  4.065958  0.000000
  0.093407  0.008035  0.000751  0.146034  4.112883  0.000000
  0.140110  0.008035  0.001126  0.247089  4.159809  0.000000
  0.186813  0.008035  0.001501  0.329316  4.206734  0.000000
  0.233516  0.008035  0.001876  0.378142  4.253660  0.000000
  0.250000  0.008035  0.002009  0.416820  4.270222  0.000000
  END FTABLE 11
  FTABLE     14
   87    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.012167  0.000000  0.000000  0.000000
  0.046703  0.012167  0.000236  0.000000  0.000000
  0.093407  0.012167  0.000472  0.000000  0.000845
  0.140110  0.012167  0.000707  0.000000  0.001990
  0.186813  0.012167  0.000943  0.000000  0.003751
  0.233516  0.012167  0.001179  0.000000  0.006213
  0.280220  0.012167  0.001415  0.000000  0.008220
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0.326923	0.012167	0.001651	0.000000	0.008220
0.373626	0.012167	0.001887	0.000000	0.008220
0.420330	0.012167	0.002122	0.000000	0.008220
0.467033	0.012167	0.002358	0.000000	0.008220
0.513736	0.012167	0.002594	0.000000	0.008220
0.560440	0.012167	0.002830	0.000000	0.008220
0.607143	0.012167	0.003066	0.000000	0.008220
0.653846	0.012167	0.003302	0.000000	0.008220
0.700549	0.012167	0.003537	0.000000	0.008220
0.747253	0.012167	0.003773	0.000000	0.008220
0.793956	0.012167	0.004009	0.000000	0.008220
0.840659	0.012167	0.004245	0.000000	0.008220
0.887363	0.012167	0.004481	0.000000	0.008220
0.934066	0.012167	0.004716	0.000000	0.008220
0.980769	0.012167	0.004952	0.000000	0.008220
1.027473	0.012167	0.005188	0.000000	0.008220
1.074176	0.012167	0.005424	0.000000	0.008220
1.120879	0.012167	0.005660	0.000000	0.008220
1.167582	0.012167	0.005896	0.000000	0.008220
1.214286	0.012167	0.006131	0.000000	0.008220
1.260989	0.012167	0.006367	0.000000	0.008220
1.307692	0.012167	0.006603	0.000000	0.008220
1.354396	0.012167	0.006839	0.000000	0.008220
1.401099	0.012167	0.007075	0.000000	0.008220
1.447802	0.012167	0.007310	0.000000	0.008220
1.494505	0.012167	0.007546	0.000000	0.008220
1.541209	0.012167	0.007782	0.000000	0.008220
1.587912	0.012167	0.008018	0.000000	0.008220
1.634615	0.012167	0.008254	0.000000	0.008220
1.681319	0.012167	0.008490	0.000000	0.008220
1.728022	0.012167	0.008725	0.000000	0.008220
1.774725	0.012167	0.008961	0.000000	0.008220
1.821429	0.012167	0.009197	0.000000	0.008220
1.868132	0.012167	0.009433	0.000000	0.008220
1.914835	0.012167	0.009669	0.000000	0.008220
1.961538	0.012167	0.009905	0.000000	0.008220
2.008242	0.012167	0.010140	0.000000	0.008220
2.054945	0.012167	0.010376	0.000000	0.008220
2.101648	0.012167	0.010612	0.000000	0.008220
2.148352	0.012167	0.010848	0.000000	0.008220
2.195055	0.012167	0.011084	0.000000	0.008220
2.241758	0.012167	0.011319	0.000000	0.008220
2.288462	0.012167	0.011555	0.000000	0.008220
2.335165	0.012167	0.011791	0.000000	0.008220
2.381868	0.012167	0.012027	0.000000	0.008220
2.428571	0.012167	0.012263	0.000000	0.008220
2.475275	0.012167	0.012499	0.000000	0.008220
2.521978	0.012167	0.012734	0.000000	0.008220
2.568681	0.012167	0.012970	0.000000	0.008220
2.615385	0.012167	0.013206	0.000000	0.008220
2.662088	0.012167	0.013442	0.000000	0.008220
2.708791	0.012167	0.013678	0.000000	0.008220
2.755495	0.012167	0.013913	0.000000	0.008220
2.802198	0.012167	0.014149	0.000000	0.008220
2.848901	0.012167	0.014385	0.000000	0.008220
2.895604	0.012167	0.014621	0.000000	0.008220
2.942308	0.012167	0.014857	0.000000	0.008220
2.989011	0.012167	0.015093	0.000000	0.008220
3.035714	0.012167	0.015328	0.000000	0.008220
3.082418	0.012167	0.015564	0.000000	0.008220
3.129121	0.012167	0.015800	0.000000	0.008220
3.175824	0.012167	0.016036	0.000000	0.008220
3.222527	0.012167	0.016272	0.000000	0.008220
3.269231	0.012167	0.016508	0.000000	0.008220
3.315934	0.012167	0.016743	0.000000	0.008220
3.362637	0.012167	0.016979	0.000000	0.008220
3.409341	0.012167	0.017215	0.000000	0.008220
3.456044	0.012167	0.017451	0.000000	0.008220
3.502747	0.012167	0.017687	0.000000	0.008220
3.549451	0.012167	0.017922	0.000000	0.008220

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  3.596154  0.012167  0.018158  0.000000  0.008220
  3.642857  0.012167  0.018394  0.000000  0.008220
  3.689560  0.012167  0.018630  0.000000  0.008220
  3.736264  0.012167  0.018866  0.000000  0.008220
  3.782967  0.012167  0.019102  0.000000  0.008220
  3.829670  0.012167  0.019337  0.000000  0.008220
  3.876374  0.012167  0.019573  0.000000  0.008220
  3.923077  0.012167  0.019809  0.000000  0.008220
  3.969780  0.012167  0.020045  0.000000  0.008220
  4.000000  0.012167  0.042415  0.000000  0.008220
  END FTABLE 14
  FTABLE     13
    7    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.012167  0.000000  0.000000  0.000000  0.000000
  0.046703  0.012167  0.000568  0.106977  6.157022  0.000000
  0.093407  0.012167  0.001136  0.301385  6.228080  0.000000
  0.140110  0.012167  0.001705  0.547857  6.299139  0.000000
  0.186813  0.012167  0.002273  0.826090  6.370197  0.000000
  0.233516  0.012167  0.002841  1.116169  6.441256  0.000000
  0.250000  0.012167  0.003042  1.397744  6.466336  0.000000
  END FTABLE 13
  FTABLE     16
   87    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.008494  0.000000  0.000000  0.000000
  0.046703  0.008494  0.000165  0.000000  0.000000
  0.093407  0.008494  0.000329  0.000000  0.000590
  0.140110  0.008494  0.000494  0.000000  0.001389
  0.186813  0.008494  0.000659  0.000000  0.002619
  0.233516  0.008494  0.000823  0.000000  0.004337
  0.280220  0.008494  0.000988  0.000000  0.005738
  0.326923  0.008494  0.001152  0.000000  0.005738
  0.373626  0.008494  0.001317  0.000000  0.005738
  0.420330  0.008494  0.001482  0.000000  0.005738
  0.467033  0.008494  0.001646  0.000000  0.005738
  0.513736  0.008494  0.001811  0.000000  0.005738
  0.560440  0.008494  0.001976  0.000000  0.005738
  0.607143  0.008494  0.002140  0.000000  0.005738
  0.653846  0.008494  0.002305  0.000000  0.005738
  0.700549  0.008494  0.002469  0.000000  0.005738
  0.747253  0.008494  0.002634  0.000000  0.005738
  0.793956  0.008494  0.002799  0.000000  0.005738
  0.840659  0.008494  0.002963  0.000000  0.005738
  0.887363  0.008494  0.003128  0.000000  0.005738
  0.934066  0.008494  0.003293  0.000000  0.005738
  0.980769  0.008494  0.003457  0.000000  0.005738
  1.027473  0.008494  0.003622  0.000000  0.005738
  1.074176  0.008494  0.003786  0.000000  0.005738
  1.120879  0.008494  0.003951  0.000000  0.005738
  1.167582  0.008494  0.004116  0.000000  0.005738
  1.214286  0.008494  0.004280  0.000000  0.005738
  1.260989  0.008494  0.004445  0.000000  0.005738
  1.307692  0.008494  0.004610  0.000000  0.005738
  1.354396  0.008494  0.004774  0.000000  0.005738
  1.401099  0.008494  0.004939  0.000000  0.005738
  1.447802  0.008494  0.005104  0.000000  0.005738
  1.494505  0.008494  0.005268  0.000000  0.005738
  1.541209  0.008494  0.005433  0.000000  0.005738
  1.587912  0.008494  0.005597  0.000000  0.005738
  1.634615  0.008494  0.005762  0.000000  0.005738
  1.681319  0.008494  0.005927  0.000000  0.005738
  1.728022  0.008494  0.006091  0.000000  0.005738
  1.774725  0.008494  0.006256  0.000000  0.005738
  1.821429  0.008494  0.006421  0.000000  0.005738
  1.868132  0.008494  0.006585  0.000000  0.005738
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  1.914835  0.008494  0.006750  0.000000  0.005738
  1.961538  0.008494  0.006914  0.000000  0.005738
  2.008242  0.008494  0.007079  0.000000  0.005738
  2.054945  0.008494  0.007244  0.000000  0.005738
  2.101648  0.008494  0.007408  0.000000  0.005738
  2.148352  0.008494  0.007573  0.000000  0.005738
  2.195055  0.008494  0.007738  0.000000  0.005738
  2.241758  0.008494  0.007902  0.000000  0.005738
  2.288462  0.008494  0.008067  0.000000  0.005738
  2.335165  0.008494  0.008232  0.000000  0.005738
  2.381868  0.008494  0.008396  0.000000  0.005738
  2.428571  0.008494  0.008561  0.000000  0.005738
  2.475275  0.008494  0.008725  0.000000  0.005738
  2.521978  0.008494  0.008890  0.000000  0.005738
  2.568681  0.008494  0.009055  0.000000  0.005738
  2.615385  0.008494  0.009219  0.000000  0.005738
  2.662088  0.008494  0.009384  0.000000  0.005738
  2.708791  0.008494  0.009549  0.000000  0.005738
  2.755495  0.008494  0.009713  0.000000  0.005738
  2.802198  0.008494  0.009878  0.000000  0.005738
  2.848901  0.008494  0.010042  0.000000  0.005738
  2.895604  0.008494  0.010207  0.000000  0.005738
  2.942308  0.008494  0.010372  0.000000  0.005738
  2.989011  0.008494  0.010536  0.000000  0.005738
  3.035714  0.008494  0.010701  0.000000  0.005738
  3.082418  0.008494  0.010866  0.000000  0.005738
  3.129121  0.008494  0.011030  0.000000  0.005738
  3.175824  0.008494  0.011195  0.000000  0.005738
  3.222527  0.008494  0.011359  0.000000  0.005738
  3.269231  0.008494  0.011524  0.000000  0.005738
  3.315934  0.008494  0.011689  0.000000  0.005738
  3.362637  0.008494  0.011853  0.000000  0.005738
  3.409341  0.008494  0.012018  0.000000  0.005738
  3.456044  0.008494  0.012183  0.000000  0.005738
  3.502747  0.008494  0.012347  0.000000  0.005738
  3.549451  0.008494  0.012512  0.000000  0.005738
  3.596154  0.008494  0.012677  0.000000  0.005738
  3.642857  0.008494  0.012841  0.000000  0.005738
  3.689560  0.008494  0.013006  0.000000  0.005738
  3.736264  0.008494  0.013170  0.000000  0.005738
  3.782967  0.008494  0.013335  0.000000  0.005738
  3.829670  0.008494  0.013500  0.000000  0.005738
  3.876374  0.008494  0.013664  0.000000  0.005738
  3.923077  0.008494  0.013829  0.000000  0.005738
  3.969780  0.008494  0.013994  0.000000  0.005738
  4.000000  0.008494  0.029610  0.000000  0.005738
  END FTABLE 16
  FTABLE     15
    7    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.008494  0.000000  0.000000  0.000000  0.000000
  0.046703  0.008494  0.000397  0.106977  4.298298  0.000000
  0.093407  0.008494  0.000793  0.301385  4.347905  0.000000
  0.140110  0.008494  0.001190  0.547857  4.397512  0.000000
  0.186813  0.008494  0.001587  0.826090  4.447119  0.000000
  0.233516  0.008494  0.001983  1.116169  4.496726  0.000000
  0.250000  0.008494  0.002124  1.397744  4.514234  0.000000
  END FTABLE 15
  FTABLE     18
   87    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.019054  0.000000  0.000000  0.000000
  0.046703  0.019054  0.000369  0.000000  0.000000
  0.093407  0.019054  0.000739  0.000000  0.001323
  0.140110  0.019054  0.001108  0.000000  0.003116
  0.186813  0.019054  0.001477  0.000000  0.005874
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0.233516	0.019054	0.001847	0.000000	0.009730
0.280220	0.019054	0.002216	0.000000	0.012873
0.326923	0.019054	0.002585	0.000000	0.012873
0.373626	0.019054	0.002954	0.000000	0.012873
0.420330	0.019054	0.003324	0.000000	0.012873
0.467033	0.019054	0.003693	0.000000	0.012873
0.513736	0.019054	0.004062	0.000000	0.012873
0.560440	0.019054	0.004432	0.000000	0.012873
0.607143	0.019054	0.004801	0.000000	0.012873
0.653846	0.019054	0.005170	0.000000	0.012873
0.700549	0.019054	0.005540	0.000000	0.012873
0.747253	0.019054	0.005909	0.000000	0.012873
0.793956	0.019054	0.006278	0.000000	0.012873
0.840659	0.019054	0.006648	0.000000	0.012873
0.887363	0.019054	0.007017	0.000000	0.012873
0.934066	0.019054	0.007386	0.000000	0.012873
0.980769	0.019054	0.007755	0.000000	0.012873
1.027473	0.019054	0.008125	0.000000	0.012873
1.074176	0.019054	0.008494	0.000000	0.012873
1.120879	0.019054	0.008863	0.000000	0.012873
1.167582	0.019054	0.009233	0.000000	0.012873
1.214286	0.019054	0.009602	0.000000	0.012873
1.260989	0.019054	0.009971	0.000000	0.012873
1.307692	0.019054	0.010341	0.000000	0.012873
1.354396	0.019054	0.010710	0.000000	0.012873
1.401099	0.019054	0.011079	0.000000	0.012873
1.447802	0.019054	0.011448	0.000000	0.012873
1.494505	0.019054	0.011818	0.000000	0.012873
1.541209	0.019054	0.012187	0.000000	0.012873
1.587912	0.019054	0.012556	0.000000	0.012873
1.634615	0.019054	0.012926	0.000000	0.012873
1.681319	0.019054	0.013295	0.000000	0.012873
1.728022	0.019054	0.013664	0.000000	0.012873
1.774725	0.019054	0.014034	0.000000	0.012873
1.821429	0.019054	0.014403	0.000000	0.012873
1.868132	0.019054	0.014772	0.000000	0.012873
1.914835	0.019054	0.015142	0.000000	0.012873
1.961538	0.019054	0.015511	0.000000	0.012873
2.008242	0.019054	0.015880	0.000000	0.012873
2.054945	0.019054	0.016249	0.000000	0.012873
2.101648	0.019054	0.016619	0.000000	0.012873
2.148352	0.019054	0.016988	0.000000	0.012873
2.195055	0.019054	0.017357	0.000000	0.012873
2.241758	0.019054	0.017727	0.000000	0.012873
2.288462	0.019054	0.018096	0.000000	0.012873
2.335165	0.019054	0.018465	0.000000	0.012873
2.381868	0.019054	0.018835	0.000000	0.012873
2.428571	0.019054	0.019204	0.000000	0.012873
2.475275	0.019054	0.019573	0.000000	0.012873
2.521978	0.019054	0.019943	0.000000	0.012873
2.568681	0.019054	0.020312	0.000000	0.012873
2.615385	0.019054	0.020681	0.000000	0.012873
2.662088	0.019054	0.021050	0.000000	0.012873
2.708791	0.019054	0.021420	0.000000	0.012873
2.755495	0.019054	0.021789	0.000000	0.012873
2.802198	0.019054	0.022158	0.000000	0.012873
2.848901	0.019054	0.022528	0.000000	0.012873
2.895604	0.019054	0.022897	0.000000	0.012873
2.942308	0.019054	0.023266	0.000000	0.012873
2.989011	0.019054	0.023636	0.000000	0.012873
3.035714	0.019054	0.024005	0.000000	0.012873
3.082418	0.019054	0.024374	0.000000	0.012873
3.129121	0.019054	0.024743	0.000000	0.012873
3.175824	0.019054	0.025113	0.000000	0.012873
3.222527	0.019054	0.025482	0.000000	0.012873
3.269231	0.019054	0.025851	0.000000	0.012873
3.315934	0.019054	0.026221	0.000000	0.012873
3.362637	0.019054	0.026590	0.000000	0.012873
3.409341	0.019054	0.026959	0.000000	0.012873
3.456044	0.019054	0.027329	0.000000	0.012873

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  3.502747  0.019054  0.027698  0.000000  0.012873
  3.549451  0.019054  0.028067  0.000000  0.012873
  3.596154  0.019054  0.028437  0.000000  0.012873
  3.642857  0.019054  0.028806  0.000000  0.012873
  3.689560  0.019054  0.029175  0.000000  0.012873
  3.736264  0.019054  0.029544  0.000000  0.012873
  3.782967  0.019054  0.029914  0.000000  0.012873
  3.829670  0.019054  0.030283  0.000000  0.012873
  3.876374  0.019054  0.030652  0.000000  0.012873
  3.923077  0.019054  0.031022  0.000000  0.012873
  3.969780  0.019054  0.031391  0.000000  0.012873
  4.000000  0.019054  0.066423  0.000000  0.012873
  END FTABLE 18
  FTABLE     17
    7    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.019054  0.000000  0.000000  0.000000  0.000000
  0.046703  0.019054  0.000890  0.106977  9.642128  0.000000
  0.093407  0.019054  0.001780  0.301385  9.753409  0.000000
  0.140110  0.019054  0.002670  0.547857  9.864689  0.000000
  0.186813  0.019054  0.003560  0.826090  9.975970  0.000000
  0.233516  0.019054  0.004449  1.116169  10.08725  0.000000
  0.250000  0.019054  0.004764  1.397744  10.12653  0.000000
  END FTABLE 17
  FTABLE     20
   87    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.031795  0.000000  0.000000  0.000000
  0.046703  0.031795  0.000616  0.000000  0.000000
  0.093407  0.031795  0.001233  0.000000  0.002207
  0.140110  0.031795  0.001849  0.000000  0.005199
  0.186813  0.031795  0.002465  0.000000  0.009802
  0.233516  0.031795  0.003081  0.000000  0.016236
  0.280220  0.031795  0.003698  0.000000  0.021480
  0.326923  0.031795  0.004314  0.000000  0.021480
  0.373626  0.031795  0.004930  0.000000  0.021480
  0.420330  0.031795  0.005546  0.000000  0.021480
  0.467033  0.031795  0.006163  0.000000  0.021480
  0.513736  0.031795  0.006779  0.000000  0.021480
  0.560440  0.031795  0.007395  0.000000  0.021480
  0.607143  0.031795  0.008011  0.000000  0.021480
  0.653846  0.031795  0.008628  0.000000  0.021480
  0.700549  0.031795  0.009244  0.000000  0.021480
  0.747253  0.031795  0.009860  0.000000  0.021480
  0.793956  0.031795  0.010476  0.000000  0.021480
  0.840659  0.031795  0.011093  0.000000  0.021480
  0.887363  0.031795  0.011709  0.000000  0.021480
  0.934066  0.031795  0.012325  0.000000  0.021480
  0.980769  0.031795  0.012941  0.000000  0.021480
  1.027473  0.031795  0.013558  0.000000  0.021480
  1.074176  0.031795  0.014174  0.000000  0.021480
  1.120879  0.031795  0.014790  0.000000  0.021480
  1.167582  0.031795  0.015406  0.000000  0.021480
  1.214286  0.031795  0.016023  0.000000  0.021480
  1.260989  0.031795  0.016639  0.000000  0.021480
  1.307692  0.031795  0.017255  0.000000  0.021480
  1.354396  0.031795  0.017871  0.000000  0.021480
  1.401099  0.031795  0.018488  0.000000  0.021480
  1.447802  0.031795  0.019104  0.000000  0.021480
  1.494505  0.031795  0.019720  0.000000  0.021480
  1.541209  0.031795  0.020336  0.000000  0.021480
  1.587912  0.031795  0.020953  0.000000  0.021480
  1.634615  0.031795  0.021569  0.000000  0.021480
  1.681319  0.031795  0.022185  0.000000  0.021480
  1.728022  0.031795  0.022801  0.000000  0.021480
  1.774725  0.031795  0.023418  0.000000  0.021480
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  1.821429  0.031795  0.024034  0.000000  0.021480
  1.868132  0.031795  0.024650  0.000000  0.021480
  1.914835  0.031795  0.025266  0.000000  0.021480
  1.961538  0.031795  0.025883  0.000000  0.021480
  2.008242  0.031795  0.026499  0.000000  0.021480
  2.054945  0.031795  0.027115  0.000000  0.021480
  2.101648  0.031795  0.027731  0.000000  0.021480
  2.148352  0.031795  0.028348  0.000000  0.021480
  2.195055  0.031795  0.028964  0.000000  0.021480
  2.241758  0.031795  0.029580  0.000000  0.021480
  2.288462  0.031795  0.030196  0.000000  0.021480
  2.335165  0.031795  0.030813  0.000000  0.021480
  2.381868  0.031795  0.031429  0.000000  0.021480
  2.428571  0.031795  0.032045  0.000000  0.021480
  2.475275  0.031795  0.032661  0.000000  0.021480
  2.521978  0.031795  0.033278  0.000000  0.021480
  2.568681  0.031795  0.033894  0.000000  0.021480
  2.615385  0.031795  0.034510  0.000000  0.021480
  2.662088  0.031795  0.035126  0.000000  0.021480
  2.708791  0.031795  0.035743  0.000000  0.021480
  2.755495  0.031795  0.036359  0.000000  0.021480
  2.802198  0.031795  0.036975  0.000000  0.021480
  2.848901  0.031795  0.037591  0.000000  0.021480
  2.895604  0.031795  0.038208  0.000000  0.021480
  2.942308  0.031795  0.038824  0.000000  0.021480
  2.989011  0.031795  0.039440  0.000000  0.021480
  3.035714  0.031795  0.040056  0.000000  0.021480
  3.082418  0.031795  0.040673  0.000000  0.021480
  3.129121  0.031795  0.041289  0.000000  0.021480
  3.175824  0.031795  0.041905  0.000000  0.021480
  3.222527  0.031795  0.042521  0.000000  0.021480
  3.269231  0.031795  0.043138  0.000000  0.021480
  3.315934  0.031795  0.043754  0.000000  0.021480
  3.362637  0.031795  0.044370  0.000000  0.021480
  3.409341  0.031795  0.044986  0.000000  0.021480
  3.456044  0.031795  0.045603  0.000000  0.021480
  3.502747  0.031795  0.046219  0.000000  0.021480
  3.549451  0.031795  0.046835  0.000000  0.021480
  3.596154  0.031795  0.047451  0.000000  0.021480
  3.642857  0.031795  0.048068  0.000000  0.021480
  3.689560  0.031795  0.048684  0.000000  0.021480
  3.736264  0.031795  0.049300  0.000000  0.021480
  3.782967  0.031795  0.049916  0.000000  0.021480
  3.829670  0.031795  0.050533  0.000000  0.021480
  3.876374  0.031795  0.051149  0.000000  0.021480
  3.923077  0.031795  0.051765  0.000000  0.021480
  3.969780  0.031795  0.052381  0.000000  0.021480
  4.000000  0.031795  0.110838  0.000000  0.021480
  END FTABLE 20
  FTABLE     19
    7    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.031795  0.000000  0.000000  0.000000  0.000000
  0.046703  0.031795  0.001485  0.053278  16.08958  0.000000
  0.093407  0.031795  0.002970  0.146034  16.27527  0.000000
  0.140110  0.031795  0.004455  0.247089  16.46096  0.000000
  0.186813  0.031795  0.005940  0.329316  16.64665  0.000000
  0.233516  0.031795  0.007425  0.378142  16.83234  0.000000
  0.250000  0.031795  0.007949  0.416820  16.89788  0.000000
  END FTABLE 19
  FTABLE     22
   89    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.031680  0.000000  0.000000  0.000000
  0.148352  0.031680  0.001950  0.000000  0.000321
  0.296703  0.031680  0.003901  0.000000  0.001509
```

0.445055	0.031680	0.005851	0.000000	0.003896
0.593407	0.031680	0.007802	0.000000	0.007739
0.741758	0.031680	0.009752	0.000000	0.013256
0.890110	0.031680	0.011703	0.000000	0.020640
1.038462	0.031680	0.013653	0.000000	0.021403
1.186813	0.031680	0.015603	0.000000	0.021403
1.335165	0.031680	0.017554	0.000000	0.021403
1.483516	0.031680	0.019504	0.000000	0.021403
1.631868	0.031680	0.021455	0.000000	0.021403
1.780220	0.031680	0.023405	0.000000	0.021403
1.928571	0.031680	0.025356	0.000000	0.021403
2.076923	0.031680	0.027306	0.000000	0.021403
2.225275	0.031680	0.029257	0.000000	0.021403
2.373626	0.031680	0.031207	0.000000	0.021403
2.521978	0.031680	0.033157	0.000000	0.021403
2.670330	0.031680	0.035108	0.000000	0.021403
2.818681	0.031680	0.037058	0.000000	0.021403
2.967033	0.031680	0.039009	0.000000	0.021403
3.115385	0.031680	0.040959	0.000000	0.021403
3.263736	0.031680	0.042910	0.000000	0.021403
3.412088	0.031680	0.044860	0.000000	0.021403
3.560440	0.031680	0.046810	0.000000	0.021403
3.708791	0.031680	0.048761	0.000000	0.021403
3.857143	0.031680	0.050711	0.000000	0.021403
4.005495	0.031680	0.052662	0.000000	0.021403
4.153846	0.031680	0.054612	0.000000	0.021403
4.302198	0.031680	0.056563	0.000000	0.021403
4.450549	0.031680	0.058513	0.000000	0.021403
4.598901	0.031680	0.060464	0.000000	0.021403
4.747253	0.031680	0.062414	0.000000	0.021403
4.895604	0.031680	0.064364	0.000000	0.021403
5.043956	0.031680	0.066315	0.000000	0.021403
5.192308	0.031680	0.068265	0.000000	0.021403
5.340659	0.031680	0.070216	0.000000	0.021403
5.489011	0.031680	0.072166	0.000000	0.021403
5.637363	0.031680	0.074117	0.000000	0.021403
5.785714	0.031680	0.076067	0.000000	0.021403
5.934066	0.031680	0.078017	0.000000	0.021403
6.082418	0.031680	0.079968	0.000000	0.021403
6.230769	0.031680	0.081918	0.000000	0.021403
6.379121	0.031680	0.083869	0.000000	0.021403
6.527473	0.031680	0.085819	0.000000	0.021403
6.675824	0.031680	0.087770	0.000000	0.021403
6.824176	0.031680	0.089720	0.000000	0.021403
6.972527	0.031680	0.091670	0.000000	0.021403
7.120879	0.031680	0.093621	0.000000	0.021403
7.269231	0.031680	0.095571	0.000000	0.021403
7.417582	0.031680	0.097522	0.000000	0.021403
7.565934	0.031680	0.099472	0.000000	0.021403
7.714286	0.031680	0.101423	0.000000	0.021403
7.862637	0.031680	0.103373	0.000000	0.021403
8.010989	0.031680	0.105324	0.000000	0.021403
8.159341	0.031680	0.107274	0.000000	0.021403
8.307692	0.031680	0.109224	0.000000	0.021403
8.456044	0.031680	0.111175	0.000000	0.021403
8.604396	0.031680	0.113125	0.000000	0.021403
8.752747	0.031680	0.115076	0.000000	0.021403
8.901099	0.031680	0.117026	0.000000	0.021403
9.049451	0.031680	0.118977	0.000000	0.021403
9.197802	0.031680	0.120927	0.000000	0.021403
9.346154	0.031680	0.122877	0.000000	0.021403
9.494505	0.031680	0.124828	0.000000	0.021403
9.642857	0.031680	0.126778	0.000000	0.021403
9.791209	0.031680	0.128729	0.000000	0.021403
9.939560	0.031680	0.130679	0.000000	0.021403
10.08791	0.031680	0.132630	0.000000	0.021403
10.23626	0.031680	0.134580	0.000000	0.021403
10.38462	0.031680	0.136531	0.000000	0.021403
10.53297	0.031680	0.138481	0.000000	0.021403
10.68132	0.031680	0.140431	0.000000	0.021403

```
  10.82967  0.031680  0.142382  0.000000  0.021403
  10.97802  0.031680  0.144332  0.000000  0.021403
  11.12637  0.031680  0.146283  0.000000  0.021403
  11.27473  0.031680  0.148233  0.000000  0.021403
  11.42308  0.031680  0.150184  0.000000  0.021403
  11.57143  0.031680  0.152134  0.000000  0.021403
  11.71978  0.031680  0.154084  0.000000  0.021403
  11.86813  0.031680  0.156035  0.000000  0.021403
  12.01648  0.031680  0.157985  0.000000  0.021403
  12.16484  0.031680  0.159936  0.000000  0.021403
  12.31319  0.031680  0.161886  0.000000  0.021403
  12.46154  0.031680  0.163837  0.000000  0.021403
  12.60989  0.031680  0.165787  0.000000  0.021403
  12.75824  0.031680  0.167737  0.000000  0.021403
  12.90659  0.031680  0.169688  0.000000  0.021403
  13.00000  0.031680  0.358924  0.000000  0.021403
  END FTABLE 22
  FTABLE     21
    5    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.031680  0.000000  0.000000  0.000000  0.000000
  0.148352  0.031680  0.004700  0.595207  16.02730  0.000000
  0.296703  0.031680  0.009400  1.491422  16.20814  0.000000
  0.445055  0.031680  0.014100  2.089716  16.38897  0.000000
  0.500000  0.031680  0.015840  2.426251  16.45595  0.000000
  END FTABLE 21
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.448          PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.448          IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP
WDM      2 PREC     ENGL    1.448          RCHRES   1     EXTNL  PREC
WDM      2 PREC     ENGL    1.448          RCHRES   3     EXTNL  PREC
WDM      2 PREC     ENGL    1.448          RCHRES   5     EXTNL  PREC
WDM      2 PREC     ENGL    1.448          RCHRES   7     EXTNL  PREC
WDM      2 PREC     ENGL    1.448          RCHRES   9     EXTNL  PREC
WDM      2 PREC     ENGL    1.448          RCHRES  11     EXTNL  PREC
WDM      2 PREC     ENGL    1.448          RCHRES  13     EXTNL  PREC
WDM      2 PREC     ENGL    1.448          RCHRES  15     EXTNL  PREC
WDM      2 PREC     ENGL    1.448          RCHRES  17     EXTNL  PREC
WDM      2 PREC     ENGL    1.448          RCHRES  19     EXTNL  PREC
WDM      2 PREC     ENGL    1.448          RCHRES  21     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   2     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   3     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   4     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   5     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   6     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   7     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   8     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   9     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES  10     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES  11     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES  12     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES  13     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES  14     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES  15     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES  16     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES  17     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES  18     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES  19     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES  20     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES  21     EXTNL  POTEV
```

```
WDM      1 EVAP     ENGL    0.7            RCHRES  22     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #         <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   2 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL       REPL
RCHRES   2 HYDR   O      1 1        1      WDM   1001 FLOW     ENGL       REPL
RCHRES   2 HYDR   O      2 1        1      WDM   1002 FLOW     ENGL       REPL
RCHRES   2 HYDR   STAGE  1 1        1      WDM   1003 STAG     ENGL       REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1004 STAG     ENGL       REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1005 FLOW     ENGL       REPL
COPY     1 OUTPUT MEAN   1 1     12.1      WDM    701 FLOW     ENGL       REPL
COPY   501 OUTPUT MEAN   1 1     12.1      WDM    801 FLOW     ENGL       REPL
RCHRES   4 HYDR   RO     1 1        1      WDM   1006 FLOW     ENGL       REPL
RCHRES   4 HYDR   O      1 1        1      WDM   1007 FLOW     ENGL       REPL
RCHRES   4 HYDR   O      2 1        1      WDM   1008 FLOW     ENGL       REPL
RCHRES   4 HYDR   STAGE  1 1        1      WDM   1009 STAG     ENGL       REPL
RCHRES   3 HYDR   STAGE  1 1        1      WDM   1010 STAG     ENGL       REPL
RCHRES   3 HYDR   O      1 1        1      WDM   1011 FLOW     ENGL       REPL
COPY     2 OUTPUT MEAN   1 1     12.1      WDM    702 FLOW     ENGL       REPL
COPY   502 OUTPUT MEAN   1 1     12.1      WDM    802 FLOW     ENGL       REPL
RCHRES   6 HYDR   RO     1 1        1      WDM   1012 FLOW     ENGL       REPL
RCHRES   6 HYDR   O      1 1        1      WDM   1013 FLOW     ENGL       REPL
RCHRES   6 HYDR   O      2 1        1      WDM   1014 FLOW     ENGL       REPL
RCHRES   6 HYDR   STAGE  1 1        1      WDM   1015 STAG     ENGL       REPL
RCHRES   5 HYDR   STAGE  1 1        1      WDM   1016 STAG     ENGL       REPL
RCHRES   5 HYDR   O      1 1        1      WDM   1017 FLOW     ENGL       REPL
RCHRES   8 HYDR   RO     1 1        1      WDM   1018 FLOW     ENGL       REPL
RCHRES   8 HYDR   O      1 1        1      WDM   1019 FLOW     ENGL       REPL
RCHRES   8 HYDR   O      2 1        1      WDM   1020 FLOW     ENGL       REPL
RCHRES   8 HYDR   STAGE  1 1        1      WDM   1021 STAG     ENGL       REPL
RCHRES   7 HYDR   STAGE  1 1        1      WDM   1022 STAG     ENGL       REPL
RCHRES   7 HYDR   O      1 1        1      WDM   1023 FLOW     ENGL       REPL
RCHRES  10 HYDR   RO     1 1        1      WDM   1024 FLOW     ENGL       REPL
RCHRES  10 HYDR   O      1 1        1      WDM   1025 FLOW     ENGL       REPL
RCHRES  10 HYDR   O      2 1        1      WDM   1026 FLOW     ENGL       REPL
RCHRES  10 HYDR   STAGE  1 1        1      WDM   1027 STAG     ENGL       REPL
RCHRES   9 HYDR   STAGE  1 1        1      WDM   1028 STAG     ENGL       REPL
RCHRES   9 HYDR   O      1 1        1      WDM   1029 FLOW     ENGL       REPL
RCHRES  12 HYDR   RO     1 1        1      WDM   1030 FLOW     ENGL       REPL
RCHRES  12 HYDR   O      1 1        1      WDM   1031 FLOW     ENGL       REPL
RCHRES  12 HYDR   O      2 1        1      WDM   1032 FLOW     ENGL       REPL
RCHRES  12 HYDR   STAGE  1 1        1      WDM   1033 STAG     ENGL       REPL
RCHRES  11 HYDR   STAGE  1 1        1      WDM   1034 STAG     ENGL       REPL
RCHRES  11 HYDR   O      1 1        1      WDM   1035 FLOW     ENGL       REPL
COPY     3 OUTPUT MEAN   1 1     12.1      WDM    703 FLOW     ENGL       REPL
COPY   503 OUTPUT MEAN   1 1     12.1      WDM    803 FLOW     ENGL       REPL
RCHRES  14 HYDR   RO     1 1        1      WDM   1036 FLOW     ENGL       REPL
RCHRES  14 HYDR   O      1 1        1      WDM   1037 FLOW     ENGL       REPL
RCHRES  14 HYDR   O      2 1        1      WDM   1038 FLOW     ENGL       REPL
RCHRES  14 HYDR   STAGE  1 1        1      WDM   1039 STAG     ENGL       REPL
RCHRES  13 HYDR   STAGE  1 1        1      WDM   1040 STAG     ENGL       REPL
RCHRES  13 HYDR   O      1 1        1      WDM   1041 FLOW     ENGL       REPL
COPY     4 OUTPUT MEAN   1 1     12.1      WDM    704 FLOW     ENGL       REPL
COPY   504 OUTPUT MEAN   1 1     12.1      WDM    804 FLOW     ENGL       REPL
RCHRES  16 HYDR   RO     1 1        1      WDM   1042 FLOW     ENGL       REPL
RCHRES  16 HYDR   O      1 1        1      WDM   1043 FLOW     ENGL       REPL
RCHRES  16 HYDR   O      2 1        1      WDM   1044 FLOW     ENGL       REPL
RCHRES  16 HYDR   STAGE  1 1        1      WDM   1045 STAG     ENGL       REPL
RCHRES  15 HYDR   STAGE  1 1        1      WDM   1046 STAG     ENGL       REPL
RCHRES  15 HYDR   O      1 1        1      WDM   1047 FLOW     ENGL       REPL
RCHRES  18 HYDR   RO     1 1        1      WDM   1048 FLOW     ENGL       REPL
RCHRES  18 HYDR   O      1 1        1      WDM   1049 FLOW     ENGL       REPL
RCHRES  18 HYDR   O      2 1        1      WDM   1050 FLOW     ENGL       REPL
RCHRES  18 HYDR   STAGE  1 1        1      WDM   1051 STAG     ENGL       REPL
RCHRES  17 HYDR   STAGE  1 1        1      WDM   1052 STAG     ENGL       REPL
RCHRES  17 HYDR   O      1 1        1      WDM   1053 FLOW     ENGL       REPL
RCHRES  20 HYDR   RO     1 1        1      WDM   1054 FLOW     ENGL       REPL
```

```
RCHRES  20 HYDR   O      1 1        1      WDM   1055 FLOW     ENGL      REPL
RCHRES  20 HYDR   O      2 1        1      WDM   1056 FLOW     ENGL      REPL
RCHRES  20 HYDR   STAGE  1 1        1      WDM   1057 STAG     ENGL      REPL
RCHRES  19 HYDR   STAGE  1 1        1      WDM   1058 STAG     ENGL      REPL
RCHRES  19 HYDR   O      1 1        1      WDM   1059 FLOW     ENGL      REPL
COPY     5 OUTPUT MEAN   1 1     12.1      WDM    705 FLOW     ENGL      REPL
COPY   505 OUTPUT MEAN   1 1     12.1      WDM    805 FLOW     ENGL      REPL
RCHRES  22 HYDR   RO     1 1        1      WDM   1060 FLOW     ENGL      REPL
RCHRES  22 HYDR   O      1 1        1      WDM   1061 FLOW     ENGL      REPL
RCHRES  22 HYDR   O      2 1        1      WDM   1062 FLOW     ENGL      REPL
RCHRES  22 HYDR   STAGE  1 1        1      WDM   1063 STAG     ENGL      REPL
RCHRES  21 HYDR   STAGE  1 1        1      WDM   1064 STAG     ENGL      REPL
RCHRES  21 HYDR   O      1 1        1      WDM   1065 FLOW     ENGL      REPL
COPY     6 OUTPUT MEAN   1 1     12.1      WDM    706 FLOW     ENGL      REPL
COPY   506 OUTPUT MEAN   1 1     12.1      WDM    806 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK        8
RCHRES     OFLOW  OVOL   2                 RCHRES         INFLOW IVOL
  END MASS-LINK    8

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1968/ 1/30 10: 0

RCHRES:     1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
7 2.3819E+02  255.00     312.55
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1968/ 1/30 10: 0

RCHRES:     1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
0.0000E+00 2040.0     -9.022E+03    4.4225     4.4225       2
```

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1968/ 1/30 10: 0

RCHRES:    19

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
7  323.43     346.26     362.37
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1968/ 1/30 10: 0

RCHRES:    19

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
0.0000E+00 2770.0     -4.725E+03    1.7057  1.7057E+00      2
```

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1968/ 1/30 10: 0

RCHRES:    21
```

```
The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
5 6.1420E+02  689.99     743.07
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1968/ 1/30 10: 0

RCHRES:    21

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
0.0000E+00 2760.0     -4.693E+03    1.7003  1.7003E+00      2
```

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1968/ 1/30 12: 0

RCHRES:     1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
7 2.3819E+02  255.00     287.07
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1968/ 1/30 12: 0

RCHRES:     1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
0.0000E+00 2040.0     -5.930E+03    2.9071  2.9071E+00      2
```

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1968/ 1/30 12: 0

RCHRES:    21

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
5 6.1420E+02  689.99     771.53
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1968/ 1/30 12: 0

RCHRES:    21

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
0.0000E+00 2760.0     -5.729E+03    2.0758  2.0758E+00      2
```

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1982/ 3/31 10: 0

RCHRES:     1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
7 2.3819E+02  255.00     274.78
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1982/ 3/31 10: 0

RCHRES:     1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
0.0000E+00 2040.0     -4.440E+03    2.1766  2.1766E+00      2
```

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1982/ 3/31 10: 0

RCHRES:    21

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
5 6.1420E+02  689.99     933.08
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1982/ 3/31 10: 0

RCHRES:    21

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
```

```
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
0.0000E+00 2760.0     -1.161E+04    4.2072  4.2072E+00      2
```

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1996/ 2/20  7: 0

RCHRES:     1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
7 2.3819E+02  255.00     301.42
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1996/ 2/20  7: 0

RCHRES:     1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
0.0000E+00 2040.0     -7.673E+03    3.7611  3.7611E+00      2
```

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1996/ 2/20  7: 0

RCHRES:    21

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
5 6.1420E+02  689.99    1038.9
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1996/ 2/20  7: 0

RCHRES:    21

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
0.0000E+00 2760.0     -1.547E+04    5.6035  5.6035E+00      2
```

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