memorandum

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To: Ms. Jane Hicks
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Marcia Grefsrud, California Department of Fish and Game
From: Ethan Ahlberg
Noll & Tam Architects
Date: November 7, 2012

Re: **08ESMF00-2012-TA-0387-1**
Corps File No. 2012-00032S - Oakland Zoo California Trail
Further details and clarifications – Section 7 Consultation
Response to Fish and Wildlife Service Letter Received May 1st, 2012

This memorandum provides the clarifying information requested in a letter from Eric Tattersall, Deputy Assistant Field Supervisor of the US Fish and Wildlife Service dated May 1, 2012 pertaining to the letter request for consultation from the US Army Corps of Engineers (Corps) dated March 9, 2012. It is part of a larger response package prepared by the East Bay Zoological Society (EBZS) to assist the Corps in responding to the information request from the USFWS. The USFWS letter requests information in a numbered list from 1-36. Noll & Tam, the architectural design team for the California Trail Expansion Project, and Aliquot Associates, the project engineers, have prepared responses to the USFWS letter pertaining details of the project. The questions from the USFWS letter are listed below, numbered as they are in the USFWS letter. The relevant questions from the USFWS are repeated in their entirety below, and our responses are in *italics*.

3) "Page 7, Section 2.2.1 Detailed Description of the Project: The description of the exhibits should be as close to the final project design as possible. Any changes to the project that may affect listed species and/or suitable habitat will result in the need for this consultation to be reinitiated."

   The project description details have been refined since approval of the project by the City of Oakland. This updated information is presented in the various project area descriptions below and the associated drawing package.

5) "Page 8, Section 2.2.1 Detailed Description of the Project, Aerial Gondola People-Moving System: This subsection does not describe the construction methods including support structure construction, equipment, construction timing or duration, or access roads needed to construct the gondola."

Design and Installation:

*Refer to **Figure 1 and 4** for the overall location of each tower, existing fire roads, temporary access ways, and construction zones. Each gondola tower (7 total) will require a 12ft x12ft spread footing onto which a steel tower will be installed. The lower station and towers 1, 2, and 3 are located within the existing zoo footprint and will not affect any natural habitat.*

*Towers 4, 5, 6, and 7 will require some limited temporary access, as indicated in **Figure 4**. An excavator will be used to excavate these footing areas and to carry construction materials to each tower site. Existing fire roads will be used to gain access to the tower locations to the greatest extent possible. **Figure 4** shows the temporary access ways needed to get the excavator to the tower locations. Two temporary access ways approximately 12ft wide will provide access to towers 4, 5, and 6. Excavators are able to descend and ascend steep terrain without requiring grading.*

Materials such as steel reinforcement form lumber, and appurtenances can be carried in by the excavators. A loader will carry out soil spoils from each foundation excavation.

***Temporary Access Lane 1** will be approximately 180 feet long providing access to tower 4 from **Existing Fire Road B**. **Temporary Access Lane 2** will be 300 feet long and access tower's 5 and 6 from **Existing Fire Road A**. This lane will drop down a slope of grassland cover and open oak trees. A 20 foot x 20 foot area around each foundation is needed for the excavator to stage, dig, stack materials, and provide clearances to maneuver. Once at each tower site, the excavator will grade a 15x20 foot platform outside of the construction zone to stabilize itself to work. The overall construction zone will therefore be approximately 20 feet x 35 feet in length.*

*The concrete pour can be done from a concrete truck located at the existing fire roads, refer to **Figure 4**. The reach of the concrete boom is 150 feet which will elevate the pump hose over vegetation and trees. Once beyond this reach, the pump hose will lay on the temporary access lane the remainder of the run to the excavator location. The excavator will be used to hoist up the hose at the tower location to allow workers to manipulate it for the pour. The concrete trucks can turn around at wider areas of the existing fire roads, near the location of the Bison/Tule Elk holding building construction on fire road B, and at the overnight experience construction zone on existing fire road A.*

*Tower 7 will be accessed from the Visitor Center construction zone and has been designed to avoid direct impacts to chaparral cover. The construction zone for this tower can be accessed from the east to avoid any impact to the adjacent chaparral Whipsnake habitat, see **SK-Arch-001** and **Figure 2.***

Construction duration:

All tower excavations will occur in an approximately a 5 day period. Rebar for all towers will be completed in approximately 1 week. Concrete will be poured

for all towers in approximately 1 week. Foundations will sit 5 days prior to stripping and backfilling, which will take approximately 2 days for all tower foundations. Steel columns for each tower will be placed via a helicopter in a 1 week process. Foot traffic and ATV's will use the same temporary access lanes to assist in securing the steel towers to the foundation during this erection process, which will take about 5 days. The upper gondola station is located approximately 12 feet to the northeast of tower 7, and will be constructed concurrently with the Visitor Center construction process. Refer to the response to question 6 of this response package for the detailed construction description of the Visitor Center. A revised timeline for the construction schedule will be updated following further input from the resource agencies.

6) "Page 8, Section 2.2.1 Detailed Description of the Project, California Interpretive Center: This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the building."

Building Design and Footprint Location Background:

*Refer to **SK-Arch-001** for the Visitor Center and Interpretive Center footprints. The original Interpretive Center design approved by the City of Oakland in a thick orange line. Subsequent to this approval process, the canopy line of the Chemise chaparral which constitutes the core habitat for Alameda whipsnake has been surveyed and the project has been refined in response to this information. This has been addressed by relocating a large segment of the building program to a 2nd building located further to the interior of the California Trail project, away from the chaparral habitat, and taking the place of the previously designed Grizzly Bear Viewing structure and plaza area. This building is called the Interpretive Center, and the building located near the original position is called the Visitor Center. The Visitor Center is a 3 story structure that sits in the hillside with the 1st floor matching grade on the northwest side, and the 3rd floor at grade on the southeast side. The Interpretive Center is a single story structure, located at roughly the same elevation as the 3rd floor of the Visitor Center, sharing a plaza space and fire access lane between them. The footprints of these two buildings are shown in red. This design modification allowed the Visitor Center footprint to be moved 27ft to the east out of and away from the chaparral habitat. An exterior deck constructed of concrete will cantilever 12 feet beyond the building footprint on the west facade by 12ft. This will not affect the extent of the fire fuel management, as verified during consultation with the Oakland Fire Marshal on November 6, 2012 (see response to Question 28 below).*

Construction Methods and Access:

*The Visitor Center and Interpretive Center buildings are located at the end of the **Existing Fire Road C,** please refer to **Figure 1 and 2**. Construction access will be provided with the construction of the **permanent fire access lane**, which will be located following approximately the same position as **Existing Fire Road C**. The permanent fire access lane then extends through to the east and connects to **Existing Fire Road D,** providing a loop access for*

the overall project. Please refer to the response to Question 17 for a full description of new paved roads and pathways. The buildings will be constructed of cast in place concrete, steel and wood structure, and light frame wood exterior walls. The structure will have a sprinkler system, plumbing, drainage, air conditioning, power, and lighting. The Visitor Center which houses the upper gondola station will be a Type IA building, which means the structure is fire rated to 3 hours. The end of the ***existing fire road C*** *was leveled off in the past with a large quantity of earth fill. This fill will be removed as part of the excavation process. This existing fill zone extends downslope to the edge of the chaparral habitat to the west and woodland habitat to the north, and will define the edge of construction activities.*

As described in the SMNDA and Biological Assessment, a site construction exclusion fence will be erected prior to initiating any clearing and grading activities to prevent any Alameda whipsnake's from possibly entering the construction zone. Care will be made to not damage the root systems of trees or shrubs to be retained with any construction activity. The upslope area will be shored and protected to avoid any run off that could damage the area. Once the excavation is complete the gondola station and building foundation work will commence accessed from the east, away from the chaparral habitat, please refer to ***Figure 2 and SK-Arch-001****. All concrete vehicles will stay within the project construction access area, and will utilize the loop access of the existing fire roads and the new fire lane to go to and from the construction area, please refer to* ***Figure's 1 and 2.*** *Retaining walls are required to construct the Visitor Center's bottom two levels, and the southwestern side of the plaza area in-between the Visitor Center and the Interpretive Center. For retaining wall locations and heights please refer to* ***Figure 2, 2a, and 2b****.*

A 75-100 ton crane will be used to erect the gondola station motor prior to construction of the upper level of the building. This will be transported by vehicle on existing roads and stationed between the Visitor Center and Interpretive Center building footprints or on the existing fire road during construction. A crane pad will be excavated and a platform constructed. The Upper level of the Visitor Center and the Interpretive Center is constructed of steel / wood structural frames with wood framed walls. The construction of these elements will also likely utilize a crane during short periods and then be erected with small forklifts)

Construction Duration*:*

The construction period for the Visitor Center and Interpretive Center will be between 16-24 months. A revised timeline for the construction schedule will be updated following further input from the resource agencies.

7) "Page 8-9, Section 2.2.1 Detailed Description of the Project, Wolf, Jaguar, Eagle and Condor Exhibits: This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the exhibits."

Refer to Figure 2 and the detailed descriptions below:

Exhibit Access – Elevated Walkway

The exhibit areas will be bisected by an elevated walkway serving as the public viewing path through all exhibits in this section. The elevated walkway will follow the existing contours of the central hill of the site dividing each exhibit into a smaller zone uphill of the walkway and a larger zone downhill from the walkway. Impact in the uphill side of the walkway will be greater due to increased landscaping, irrigation, and aviaries where they occur, refer to the response to Question 15 for in depth landscaping and irrigation information. The larger downhill portions of the exhibit areas will not be modified except for native species enhancement and limited irrigation view long spray sprinkler heads, refer to the response to Questions 23 and 24. With the exception of construction of the wolf holding structure (see below), all construction activities in the area on the downhill, north side of the elevated walkway will generally be done by hand with great care to minimize disturbance to existing habitat. The existing ground cover in this area is largely grassland.. There is a graded area at the exterior fence near the wolf holding building that will require an excavator, refer to ***Figure 2.***

*The elevated walkway will be built in a linear fashion to further minimize impacts. The walkway is an average of 14 feet wide. The construction zone required to build the structure will be 10 feet either side of the edge of the structure for a total of 34 feet in width. A staging area is located about midway along the elevated walkway, and construction materials will be laid along the construction zone. The structure is elevated on a line of steel columns centered on the walkway, with the walkway platform cantilevered out to either side. This design will minimize the number of foundation piers required for the structure along its length. The foundations will be drilled concrete piers about 30 inches in diameter, with 12-18 inch diameter steel columns forming the vertical structure. These piers will be spaced 8 to 23 feet on-center depending on the actual layout and where the path needs to turn corners or avoid existing trees or other site features to be retained. The platform and railing will also be built with steel, with the walkway constructed of concrete. This non-combustible construction will minimize the need for fire fuel management for this s*tructure (*refer to the response to Question 28).*

Eagle Exhibit:

The eagle exhibit consists of an aviary structure located on the uphill (south) side of the elevated walkway, and a 440sf open air holding structure built into the south side of the aviary. The holding structure will consist of a concrete slab on grade, low level concrete masonry walls, and steel cage upper walls to a steel shed roof. There will be plumbing, drainage, power, and lighting. The aviary structure will be constructed of 30 inch diameter concrete piles with 10 inch diameter steel pipe columns. Six perimeter columns will circle a central column to allow the steel cable and mesh assembly to be laid overtop as a tensile structure. Support cables will brace the structure at angles outside of this perimeter to provide lateral strength. The bottom of the mesh is secured to a continuous concrete curb and footing that extends to 6 inches above grade. Access to the structures will be via both the temporary construction access

path as part of the elevated walkway structure and the new permanent fire lane located immediately to the south. Concrete for the aviary foundations and the holding structure floor as well as grout for the concrete masonry walls can be installed with a boom from a concrete vehicle located at the new permanent fire lane. Steel will be erected via a crane located on the fire lane and a cherry picker type lift will be used to connect and secure the tensile structure to this frame. The areas under the aviary structure will have temporary construction traffic impact.

Wolf Exhibit:

The wolf exhibit consists of an open air area with a holding pen located on the east side of the enclosure and the animal containment fence. This fence will be constructed in the same manner as the overall project's perimeter boundary fence, and largely run parallel to it, refer to the response to Question 14. The wolf holding pen is approximately 1,920sf and will consist of a slab on grade with storm drain lines, steel caging, and a corrugated metal shed roof. The animal enclosure fence will be approximately 9 feet 7 inches tall and constructed of steel posts set in concrete piers a steel bottom rail, mid rail, and to rail and 2 inch x 2 inch steel mesh. The mesh will be extending to a minimum of 3 feet below the ground as a dig barrier. The construction access area required around this structure will be a 30 foot zone around the perimeter of this structure to allow for re-grading, refer to ***Figure 2****. Grading will be done with an excavator and the concrete pour can been done remotely with a boom from a concrete vehicle located at* ***Existing Fire Road D****. The enclosure fence material will be carried to the location by hand and erected by hand. Access along the fence will be in the space between the enclosure fence and the zoo perimeter fence.*

Condor Exhibit:

The Condor Exhibit features an aviary to the uphill (south) side of the elevated walkway, a holding building built at grade and forming part of the south side of the aviary, and an enclosed, elevated viewing building built as part of the elevated boardwalk. This viewing building also serves the Jaguar Exhibit. The approximately 20ft x 20ft holding structure will consist of a concrete slab on grade, low level concrete masonry walls, and steel cage upper walls to a steel shed roof. There will be plumbing, drainage, power, and lighting.

The aviary structure will be constructed of 30 inch diameter concrete piles with 10 inch diameter steel pipe columns. Six perimeter columns will circle a central column to allow the steel cable and mesh assembly to be laid overtop as a tensile structure. Support cables will brace the structure at angles outside of this perimeter to provide lateral strength. The bottom of the mesh is secured to a continuous concrete curb and footing that extends to 6 inches above grade. Access to the structures will be via both the temporary construction access path as part of the elevated walkway structure and the new permanent fire lane located immediately to the south. Concrete for the aviary foundations and the holding structure floor as well as grout for the concrete masonry walls can be installed with a boom from a concrete vehicle located at the new permanent fire

lane. Steel will be erected via a crane located on the fire lane and a cherry picker type lift will be used to connect and secure the tensile structure to this frame. The areas under the aviary structure will have temporary construction traffic impact.

The viewing structure will be built on a grid of (23) 18 inch diameter cast in place piers with 8inch x8 inch steel columns spaced between 8-12 feet on-center. The floor is constructed of a composite steel and concrete deck on steel beams. The walls and roof will be built with light wood framed construction. The enclosed structure will have a sprinkler system, drainage, power, and lighting. Access will be via the construction temporary construction lane as described for the elevated walkway construction. The structure will be designed and built to the existing grade. Holes for the piers will be dug with an excavator. Concrete can be poured from the fire lane via a boom. The areas under the viewing structure will have temporary construction traffic impact.

Jaguar Exhibit:

See above for description of the viewing structure shared with the Condor Exhibit. The Jaguar Exhibit also consists of an Aviary, holding building, and open, outer exhibit space on the downhill (north) side of the elevated walkway, extending to the perimeter fence.

The approximately 60 ft x 28 ft holding structure will consist of a concrete slab on grade, a mixture of low height and full height concrete masonry walls, and steel cage upper walls to a composite steel and concrete roof deck supporting a green (planted) roof. There will be plumbing, drainage, power, and lighting.

The aviary structure will be constructed of 30 inch diameter concrete piles with 10 inch diameter steel pipe columns. Six perimeter columns will circle a central seventh column to allow the steel cable and mesh assembly to be laid overtop as a tensile structure. Support cables will brace the structure at angles outside of this perimeter to provide lateral strength. The bottom of the mesh is secured to a continuous concrete curb and footing that extends to 6 inches above grade. Access to the structures will be via both the temporary construction access path as part of the elevated walkway structure and the new permanent fire lane located immediately to the south. Concrete for the aviary foundations and the holding structure floor as well as grout for the concrete masonry walls can be installed with a boom from a concrete vehicle located at the new permanent fire lane. Steel will be erected via a crane located on the fire lane and a cherry picker type lift will be used to connect and secure the tensile structure to this frame. The areas under the aviary structure will have temporary construction traffic impact.

The animal enclosure fence will be approximately 18 feet 4 inches tall and constructed of steel posts set in concrete piers a steel bottom rail, mid rail, and to rail and 2 inch x 6 inch steel mesh. The mesh will be extending to a minimum of 3 feet below the ground as a dig barrier.

Access will be via the temporary construction lane as described for the elevated walkway construction. The structure will be designed and built to the

existing grade. Holes for the piers will be dug with an excavator. Concrete can be poured from the fire lane via a boom. The enclosure fence material will be carried to the location by hand and erected by hand. Access along the fence will be in the space between the enclosure fence and the zoo perimeter fence.

The construction duration for this group of exhibits and structures would be between 12-16 months.

8) "Page 9, Section 2.2.1 Detailed Description of the Project, Beaver/Water Fowl Aviary and Restrooms: This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the exhibits and restrooms."

The Beaver and Water Fowl Aviary is located on the southeast side of the Grizzly Underwater Viewing structure, refer to ***Figure 3****. The aviary features a similar structural system as the eagle and condor aviaries. This area will have a water feature with connecting infrastructure to the LSS equipment located to the east. Visitors exiting the boardwalk would cross the service road to reach the approximately 6,230-square-foot enclosed beaver and water fowl aviary. The aviary enclosure would be constructed of one-inch stainless steel coil mesh attached to a steel post frame. A path and boardwalk would meander through the inside of the aviary. An approximately 840-square-foot, 10-foot-high beaver holding facility of CMU construction would be hidden from view in the rockwork located adjacent to the Restroom building to the east.*

The restroom building is located on the east side of the project adjacent to the Grizzly Bear Water Viewing Structure and public pathway. The single story structure is approximately 760 sq. ft. The building will have plumbing, drainage, ventilation, power, and lighting. The building will sit on concrete foundations and a slab on grade with light framed wood construction for the walls and roof. Construction access will be from the area to be re-graded to the east, the adjacent Water Equipment structure and service yard, and the ***Existing Fire Roads D and E, refer to Figure 1 and 2.*** *The building pad and footings will be established with an excavator and concrete poured from one of the adjacent fire roads. The walls and roof will then be constructed by hand. The construction duration will be 12-16 months. Details on the revised timeline for the construction schedule will be updated following further input from the resource agencies.*

9) "Pages 9-10, Section 2.2.1 Detailed Description of the Project, Grizzly Bear Exhibit: This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the exhibit."

Refer to Figures 2, 2b, and 3 for this detail description section.

The grizzly bear exhibit consists of an exterior fenced exhibit, divided into two sections by a double fence set in a graded ditch. There is an approximately 2,100 sq. ft. ***Grizzly Holding building****, an approximately 1,150 sq. ft.* ***Grizzly Water Viewing Structure*** *with an adjacent artificial water feature, an*

*approximately 520 sq. ft. open air **Viewing Shed 1**, and an approximately 370 sq. ft. **Viewing Shed 2**.*

Grizzly Bear Exterior Exhibit:

*The exterior grizzly bear exhibit is enclosed by an animal enclosure fence which will be approximately 14 feet 5 inches tall and is constructed of 4 inch tube steel posts set into concrete piers with a bottom, middle, and top rail. The 2 inch x 6 inch chain link mesh extends full height and to at least 3 feet below grade to provide a dig barrier. This forms a perimeter around the entire exhibit area except where the various viewing and holding buildings form part of the enclosure area. The majority of this exhibit will have temporary construction traffic impact for access lanes, a staging area, and regarding, refer to **Figures 2 and 3**. A construction exclusionary fence will be erected to keep construction traffic out of the specific areas of oak trees and native grasses to be retained. Refer to the answer to Question 15 for a detailed description of landscaping.*

Grizzly Bear Holding Structure:

*This structure is located on the north side of the exhibit, adjacent to the proposed permanent fire lane, refer to **Figure 2**. The structure is a single story, enclosed building and includes with a concrete slab on grade, full height concrete block walls, and a composite steel and concrete green (planted) roof. The building will have a sprinkler system, plumbing, drainage, power, and lighting as well as mechanical ventilation and heating. An exterior back of house animal enclosure area is fenced in on the northwest side of the building. A site retaining wall divides this building from the exhibit, see **Figure 2b**. Construction access, storage, and staging will be from the new permanent fire lane. An excavator will prepare the foundation and graded areas, and the concrete foundations, slab, and grout in the concrete masonry walls can be poured from a concrete vehicle parked on the adjacent permanent fire lane. The roof structure will be craned into position. The crane will be located on the permanent fire lane.*

Grizzly Bear Underwater Viewing Structure:

*This structure is located on the southeast side of the grizzly enclosure, see **Figure 3**. The structure is a single story open air structure and will include concrete columns, foundation, and full height concrete walls on two sides, the other two sides will be open. The building will have a composite steel and concrete roof structure and a green (living) roof finish. The building will feature plumbing, drainage, power, and lighting. The building will be accessed from the adjacent construction zones and grading activity related to the water facilities area (refer to question 19). The water feature is adjacent to the northwest façade of the viewing structure. This area will be graded to create an artificial water feature approximately 3 feet deep. This area will be lined with waterproofing and have plumbing and drainage that will connect to the LSS water treatment facility to the east. An excavator will establish the building pad, foundation trenches, and rough grading around the building. Delivery trucks will transport building materials such as concrete block and steel to the staging area located adjacent to the site, see the area marked in blue on*

Figure 1 *between the Grizzly Holding Building and Grizzly Viewing Building. Concrete pours and wall grouting will be done from the* ***Existing Fire Road D****. A crane will be used to erect the steel structure, located either on the* ***Existing Fire Road D*** *or a temporary pad located in the regarding zone adjacent to the building.*

Grizzly Viewing Shed 1

This structure is a single story, open air shade structure with a single pitch, shed roof and one glass wall facing the Grizzly Bear Exhibit. This structure is located at the south side of the exhibit, adjacent to the Activity Zone, refer to ***Figure 3****. The structure features a concrete slab on grade and foundations, tube steel columns and roof beams, and wood roof joists. The building will have drainage, power, and lighting. An excavator will establish the building pad and foundation trenches, and rough grading around the building, accessed from the south and adjacent grading and construction zone of the Activity Area. The structure will then be erected with small equipment and by hand.*

Grizzly Viewing Shed 2

This structure is a single story, open air shade structure with a single pitch, shed roof and one glass wall facing the Grizzly Bear Exhibit. This structure is located at the southwest side of the exhibit, adjacent to the Activity Zone, refer to ***Figure 3****. The structure features a concrete slab on grade and foundations, tube steel columns and roof beams, and wood roof joists. The building will have drainage, power, and lighting. An excavator will establish the building pad and foundation trenches, and rough grading around the building, accessed from the south and adjacent grading and construction zone of the Activity Area. The structure will then be erected with small equipment and by hand.*

The exhibit will be constructed in a 12-16 month duration. Details on the revised timeline for the construction schedule will be updated following further input from the resource agencies.

10) "Page 10, Section 2.2.1 Detailed Description of the Project, Mountain Lion / Black Bear Exhibits: This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the exhibits."

Refer to Figures 3 and 3b for this detailed description.

Mountain Lion Exterior Exhibit:

The Mountain Lion Exhibit features an exterior exhibit area, an aviary exhibit next to the public path, and an approximately 1,700 sq.ft. holding building. The exterior mountain lion exhibit is enclosed by an animal enclosure fence which will be approximately 18 feet 5 inches tall and is constructed of 3 inch tube steel posts set into concrete piers with a bottom, middle, and top rail. The 2 inch x 6 inch chain link mesh extends full height and to at least 3 feet below grade to provide a dig barrier. This forms a perimeter around the entire exhibit area except where the aviary and holding building forms part of the enclosure

area. The majority of the native grasslands within the exhibit will be protected and retained except for a graded area at the east side of the exhibit shown on ***Figures 3****. A construction exclusionary fence will be erected to keep construction traffic out of the areas to be retained. Refer to the answer to question 15 for a detailed description of landscaping.*

Mountain Lion Aviary:

The aviary structure will be constructed of 30 inch diameter concrete piles with 10 inch diameter steel pipe columns. Ten perimeter columns form an "L" shaped enclosure with two central columns used to form a ridge to the tent structure. A steel cable and mesh assembly will be laid overtop as a tensile structure. Support cables will brace the structure at angles outside of this perimeter to provide lateral strength. The bottom of the mesh is secured to a continuous concrete curb and footing that extends to 6 inches above grade. The areas under the viewing structure will have temporary construction traffic impact.

Mountain Lion Holding Building

This structure is a single story, open air structure featuring a concrete slab on grade and foundations, retaining walls, a mixture of full height concrete masonry walls, partial height concrete masonry walls, and open steel structure with steel caging. The roof is a composite steel and concrete structure with a single ply membrane low slope roof. The building will have plumbing, drainage, power, and lighting. The building will have localized heating. A retaining wall forms the north side of the structure, refer to ***section 10 on Figure 3b****.*

Black Bear Exterior Exhibit:

The Black Bear Exhibit features an exterior exhibit area and an approximately 1,760sf holding building. The exterior black bear exhibit is enclosed by an animal enclosure fence which will be approximately 14 feet 5 inches tall and is constructed of 4 inch tube steel posts set into concrete piers with a bottom, middle, and top rail. The 2 inch x 6 inch chain link mesh extends full height and to at least 3 feet below grade to provide a dig barrier. This forms a perimeter around the entire exhibit area except where the various viewing and holding buildings form part of the enclosure area. The native grasslands within the exhibit will be protected and retained except where grading is required for the adjacent fire access lane on the west, and where a moat barrier is constructed at the public viewing area on the north, refer to ***Figures 3****. A construction exclusionary fence will be erected to keep construction traffic out of the areas to be retained. Refer to the answer to question 15 for a detailed description of landscaping.*

Black Bear Holding Building:

This structure is located on the north side of the exhibit, adjacent to the public viewing area and across from the Activity Zone, refer to ***Figure 3****. The structure is a single story, enclosed building and includes with a concrete slab on grade, full height concrete block walls, and a composite steel and concrete*

roof. The building will have a sprinkler system, plumbing, drainage, power, and lighting, and heating. Construction access, storage, and staging will be from the new permanent fire lane on the west and the new public path and Activity Zone construction area on the north. An excavator will prepare the foundation and graded areas, and the concrete foundations, slab, and grout in the concrete masonry walls can be poured from a concrete vehicle parked on the adjacent permanent fire lane. The roof structure will be craned into position. The crane will be located on the permanent fire lane.

Construction Methods and Access

*Access to the structures will be from the construction zone of the water systems area to the northeast as well as the fire lane on the west. Concrete for the foundations and the holding structure floor, foundation, retaining walls, and roof and grout for the concrete masonry walls can be installed with a boom from a concrete vehicle located in a central position in the construction zone, accessed from either side**, see Figure 3**. Steel will be erected via a crane located on the fire lane.*

The construction duration for the exhibit will be 12-16 months. Details on the revised timeline for the construction schedule will be updated following further input from the resource agencies.

11) "Page 10, Section 2.2.1 Detailed Description of the Project, Small Exhibit Activity Zone: This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the activity zone."

*The Small Exhibit has been deleted from the scope of work. The Activity Zone features a zone of hard and soft (ADA accessible) surfacing onto which a variety of prefabricated child play structures will be placed. The area will be surrounded by some wood picket fencing and landscape zones, and will have one main entry / exit to help parents monitor children. A loop walk will surround the Activity Zone and now feature the Botanical Exhibit. This will feature a variety of planter zones and interpretation features along the pathway forming part of the overall construction of the activity zone, see the graded area to the south of Grizzly Viewing Sheds 1 and 2 on **Figure 3**.*

Construction access will be from the main public path and the adjacent permanent fire lane. An excavator will re-grade the area as required and trucks will deliver the play equipment in pieces to be assembled. The construction duration will be between 12-16 months. Details on the revised timeline for the construction schedule will be updated following further input from the resource agencies.

12) "Pages 10-11, Section 2.2.1 Detailed Description of the Project, Interpretive Kiosk, Botanical Exhibit and Bison/Tule Elk Feeding Station: This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the exhibits."

Please refer to Figure 4 for this Detailed Description:

Interpretive Kiosk:

This structure is a circular, single story, open air, shade structure built on piers over the existing grade, accessed with a ramp. The structure is located to the southwest of project, adjacent to the child activity zone to the north, and the ***Existing Fire Road A****, refer to* ***Figure 1 and 4.*** *The platform is raised on seven (7) 6 inch diameter steel pipe columns set in 24 inch concrete piers at the perimeter. There are two (2) central 12inch diameter pipe columns set in 30 inch diameter concrete piers. A series of six (6) steel pipe columns and an 8ft wide concrete abutment support the ramp accessing the structure from the permanent fire lane. Steel beams hold the composite steel and concrete floor deck. Steel cable guard rails surround the perimeter and ramp. An interior wall occupies approximately half the platform on the northeast side. A butterfly shaped roof framed in wood is held over the platform on an additional four (4) 6 inch steel pipe columns set in 24 inch concrete piers. The platform is suspended an approximately 15-20 feet above the existing grade. The structure will have a sprinkler system, drainage, power, and lighting. Care will be made to minimize impact to the site and retain as much existing vegetation as possible. The concrete piles will be excavated with small excavation equipment. The foundation and deck pours will occur from a concrete vehicle and boom from the* ***Existing Fire Road C****. The steel framing will be installed with a crane located at the* ***Existing Fire Road C****. The areas under the kiosk structure will have temporary construction traffic impact.*

Bison/Tule Elk Feeding Station:

This exhibit occupies a valley at the southwestern portion of the project. The exhibit features an exterior animal enclosure and animal containment fence, an approximately 1,100 sq. ft. holding building, and small paved area for viewing the bison and elf feeding.

Bison/Tule Elk Exhibit:

The existing vegetation throughout the exhibit will be protected and maintained, with supplemental ground cover established if necessary. The enclosure fence is constructed of 2-1/2 inch steel posts set in concrete piers. The fence will be 8 feet tall and clad in 2 inch x 2 inch chain link mesh. The fence including piers will be constructed by hand to minimize construction traffic in the area, and be built in a linear fashion to avoid any traffic across the site.

Bison/Tule Elk Holding Building:

This approximately 1,100 sq.ft. structure is a single story, open air barn type structure with concrete spread footings and no slab. A gabled roof extends over an additional 1,100 sq. ft. yard at the front, supported on five (5) steel columns on concrete spread footings. The structure will have drainage, plumbing, power, and lighting. This structure is located on top of the ***Existing Fire Road B****. Excavator and concrete vehicles will use this existing road to*

access the construction zone. A turn around zone will be required around the site during the construction, which will also be used during the Gondola Tower 4 construction process, refer to ***Figure 4.***

Bison/Tule Elk Feeding Station:

There will be a small paved area to the north of the Interpretive Kiosk, adjacent to the Bison/Tule Elk enclosure fence and the juncture between ***Existing Fire Road A and C****. This area will be paved and construction access will be shared with the permanent fire access lane.*

The Botanical Exhibit:

The Botanical Exhibit features a variety of planter areas now located surrounding the Activity Zone, see the answer to question 11.

The construction duration will be 12-16 months. Details on the revised timeline for the construction schedule will be updated following further input from the resource agencies.

13) "Page 11, Section 2.2.1 Detailed Description of the Project, Overnight Experience: This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the campground or facilities."

Please refer to Figure 4 and 5 for this detailed description:

The Overnight Experience features (14) eight person tents on permanent raised platforms and (2) composting toilets. The area is accessed from the ***Existing Fire Road A****, which will remain unchanged as a gravel road. There is an existing loop turn around located at the project area which will be maintained and used for construction. The area within this loop have some trimming of vegetation for fire fuel management and the installation of picnic tables, refer to the enclosed memo from the Oakland Fire Marshal. A water line will be installed below* ***Existing Fire Road A****, running from the main site utility line that runs below* ***Existing Fire Road B****. The platforms will meet grade at the interior loop path, then be suspended out over grade on six (6) wood posts set in concrete pile foundations. The platform will be constructed of wood members and have a single pitch roof. A prefabricated tent will be installed within this framework. The underside of the platforms will be wrapped in a 2" x 2" chain link fence to stop animals from nesting underneath the platforms, but the mesh will be large enough to allow snakes to move through the area after the construction period is complete.*

Construction access will be by ***Existing Fire Road A****. Great care will be made to not exceed the project construction access zone. The construction duration will be approximately 3 months. Details on the revised timeline for the construction schedule will be updated following further input from the resource agencies.*

14) "Page 11, Section 2.2.1 Detailed Description of the Project, Perimeter Fence: This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the campground or facilities. Will the fence be maintained for fuels reduction? Will there be a vegetation buffer around the fence? Please provide details on the fence design and the wildlife passage mentioned in this subsection."

The perimeter fence will be eight feet tall, built with 3 inch diameter steel posts set into concrete piles at 10 feet on center. A steel bottom, middle, and top rail will hold a chain link mesh. The fence will be constructed in a linear fashion by hand, no vehicles will access these locations. Fence inspection will be done from the interior of the exhibits and by hand. Please refer to ***Figure 1****.*

15) "Page 11, Section 2.2.1 Detailed Description of the Project, Landscaping: This subsection does not describe where landscaping will occur or the methods, where the signage and/or irrigation would be located. This subsection should also include construction details similar to the above comments."

The majority of the existing landscape within the project boundary will be left undisturbed except where designated "Graded Areas, Temp. Construction Access, Construction Staging Area, Bioretention Planter or Moat/Pit" in ***Figures 1-7****. These areas will be replanted with a native meadow mix seed, planted native trees, shrubs and groundcovers, or native specimen oak trees transplanted from elsewhere on site. The areas within the animal exhibit fence enclosures that do not have the above-mentioned designations will be left undisturbed with the exception of the removal of non-native or invasive plant species or plants that will be harmful to the exhibited species. The existing vegetation under the new elevated boardwalk will be removed and replaced with a compacted gravel pathway. The existing vegetation within the area outlined by the Fire Fuel Management Line on* ***Figure 5*** *will be modified by pruning the low-lying tree limbs, trimming or removing brush and mowing/weed whipping grassland. The limited groundcover vegetation will be removed in the inner circle of the Overnight Experience area and replaced with bark mulch to create a gathering area for campers. New planting alongside the ground-level visitor pathway (designated as "Street/Walkway" on* ***Figures 1-7****) will be a mixture of new grass, native shrubs, trees and transplanted oaks to screen building facades and animal fencing where necessary. Periodic low-level interpretive signage on metal or wood posts will be placed along both sides of the visitor pathway.*

All new planted areas and areas within animal exhibits where existing vegetation will remain will be irrigated. The irrigation systems for this project will be designed for maximum coverage and ease of maintenance. The main irrigation lines will branch from mains located along the service road and under the elevated boardwalk and will roughly follow the perimeter of the exhibits. The risers should be attached to either fence posts or aviary columns with pop-up rotary sprinkler heads attached at a height that is consistent with the posts. Coverage should be from the perimeter of the exhibit inward.

17) "Pages 12-13, Section 2.2.1 Detailed Description of the Project, Access Roads and Paths: Please provide a figure or figures in the Biological Assessment that show the existing paths in relation to the proposed extended and new paths. Also provide details on construction methods, staging areas, materials, and maintenance schedule of roads and paths (need to analyze if there are on-going effects)."

Please refer to Figure 1 for existing roads and new roads and pathways.

*The new permanent fire lane which follows the **Existing Fire Road C** will be paved in asphalt. The fire access lane will be built in a linear fashion with very little additional construction access width required. Re-grading zones between 3 and 60 feet outside the road boundary each side will occur from the existing Veterinary Hospital up to the junction with **Existing Fire Road A**. From this point running north to the Interpretive Center and Visitor Center the new permanent road will slightly bend to the east further than the Existing Fire Road C to allow more clearance from the chaparral habitat. Where the lane is higher than existing grade, piles will be driven as a foundation and structural framework, with wood lagging installed on the back side. This will then be backfilled from the road side to stay away from any sensitive vegetation outside the road, refer to **Figure 1** for overall layout, **Figure 2a and 2b** showing elevated road sections, and **Figure 7a** for typical at grade sections. At the Visitor Center and Interpretive Center the lane will form part of a larger plaza area with a concrete paver or stained concrete finish, planting zones and seating areas. From this point the **Existing Fire Road C ends**, and the new permanent fire lane will run east to connect with **Existing Fire Road D**. This section will be paved in asphalt, and where above existing grade be formed with the driven piles and lagging method described above to minimize impact to adjacent vegetation and oak trees. Then the new fire lane will follow Existing Fire Lane to the eastern boundary of the project site connecting to the public way at Snowdown Ave., refer to **Figure 1 and 6**.*

The Public Path Within the California Exhibit:

*A concrete paved public path starts at the end of the elevated walkway on the east side of the project and connect to the new permanent fire lane on the southwest side of the project, see **Figure 1**.*

Other Paved Areas Within the California Exhibit:

There are small paved paths serving each holding building accessed from the fire lane or public path. There is a paved yard adjacent to the Water Equipment area on the east side of the project.

Maintenance will occur on a 2-20 year regime for regular asphalt surfaces, 1(vacuuming)-15 year regime for porous asphalt and on a 10-25 year regime for concrete surfaces.

For regular asphalt roads apply a chip seal every 2 -3 years and place a 1½" asphalt overly every 7 to 10 years. Expect replacing the base and pavement section in failed areas starting the 20th year.

Porous asphalt road areas must be cleaned once a year with a vacuum sweeper. No chip sealing or applications are applied to the surface so infiltration is maintained. Failed areas can be repaired with a pervious mix of asphalt for spot repairs.

Concrete pathways are impervious, steel reinforced, and expected to have a 25 year life and beyond. If soil movement or base failure occurs, cracks up to ¾ inch may be filled. Sections of pathway will be replaced if cracking exceeds ½ to ¾ inch or differential settlement creates a trip hazard.

18) "Page 13, Section 2.2.1 Detailed Description of the Project, Grading Plans: Please provide a final grading plan in the Biological Assessment. Will there be grading outside of the building and exhibit footprints? Will there be grading for slope stabilization?"

Figures 1, 2, and 3 *show limitations of grading which are depicted by hatching, representing 3 forms of grading disturbance in the project: Permanent Disturbance (building foundation footprints, walkways, and roads); Graded Areas (minimal space for permanent operational access around each building, and transition slopes): and Temporary Construction Access (limits for equipment to perform the grading operation that with temporarily disturbance). The legend designates the location of these 3 grading forms which are keyed to the plan on each figure.*

Every attempt has been practiced to limit grading and design a plan with minimal disturbance, while providing minimal operational requirements for animals in holding areas and housing animals in night houses.

Compliance with the Clean Water Act, Amendment C.3, requiring treatment and hydromodifcation of runoff from impervious surfaces to assure water quality and detaining flows, require bioretention basins. These basins have been located throughout the project in areas downstream of runoff sources to be collected and treated and are depicted on the plan. Temporary disturbance for drainage pipes from the basins emitting clean water onto the landscape are also shown. The number of basins have been reduced by providing harvesting of rain water to be used to clean animal night houses. A 30,000 gallon tank located west of the Interpretive Center serves as the disposal source for recaptured rain water. The tank is screened by existing oaks and masked by a natural rock facade.

Temporary staging areas and equipment storage areas are also shown on the plan. Where these areas are located outside of graded areas, they will be re-graded back to their natural contours after construction in the particular area is completed.

The area southeast of the Interpretive Center in the grizzly holding area is set aside to balance dirt and used for temporary stockpiling of soils. Although the project is designed to balance, calculations are never exact due to many factors and minimal cut and fill to balance is expected in this area. Native grasslands will be avoided where possible and replanted where disturbed. Cut and fill slopes have been minimized throughout most of the project. Areas where slopes are needed are designed to save trees in the oak woodland areas of the landscape. Retaining walls have been used minimally to limit grading around trees and limit slope encroachment into the landscape to preserve habitat.

The grading design accomplished zero disturbance of chaparral, minimal disturbance of shrub communities, minimal tree removal and limited encroachment into native grass areas.

***Figures 2 and 3 and enlarged Figure SK-Arch-001** should be viewed to see the grading limits designed in the plan.*

19) "Page 13, Section 2.2.1 Detailed Description of the Project, Water Facilities: This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the pipelines."

*A LSS Equipment structure and service yard is planned at the eastern side of the project. The LSS structure is a single story , open air structure with a slab on grade, partial height concrete masonry walls, and steel column vertical structure. A single pitch roof framed in steel and clad in corrugated metal provides cover for the LSS filtration equipment. This equipment serves the Grizzly Bear Viewing water feature to the west, refer to the bottom right hand side of **Figure 2**. The service yard will be asphalt and match the construction methods of the fire access lane described in response to question 17. The pad for the LSS structure will be established with an excavator, and concrete foundations, slab, and grout for the concrete masonry walls will be poured from the adjacent service yard area. Construction access will be from the site area to be re-graded to the north, and the **Existing Fire Roads E and D**. Steel will be erected by a crane located at one of these fire roads.*

20) "Page 14, Section 2.2.1 Detailed Description of the Project, Storm Drain Facilities. This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the facilities."

*The storm drain facilities consist of pipes and open ditches. Ditches are mostly earth swales; concrete ditches are used only along the access road leading to the project from the veterinarian hospital to curtail erosion along the road edges which would otherwise destabilize adjoining slopes and allow silt to enter the storm drain system. Most storm drains are under roads and walkways conveying collected drainage to the BMPs for treatment. Some pipes to and from the bioretention basins are in the landscape. **Figures 2 and 3** show the location of storm drain lines. Rainwater harvesting has been explained in response to comment 18. Pressure lines which convey pumped water to the*

harvesting tank from other night houses are kept within roadways and pathways. One pump line is located outside of the roadway under the condor tent enclosure.

Sanitary sewer and Water service lines commence at a pump house located at the veterinarian hospital. Fire, domestic, and irrigation water is pumped through pipes up the slope to the project's looped road providing access to the various exhibits. Along the water lines is the sanitary sewer gravity pipe. This utility corridor will use a common trench for all 3 water lines to reduce the width of disturbance during trenching.

21) "Page 15, Section 2.2.1 Detailed Description of the Project, Electricity and Natural Gas Facilities: This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the facilities."

Power lines servicing the buildings and night houses will be underground. Conduits exist which commence at Edgemont Way and currently run and serve an existing cell tower near the exhibit area. These existing conduits will be utilized to serve the project; the new power line wires will be pulled through them. No disturbance will result for electrical service other than the run from the cell tower to the project loop road from the cell tower. This new run will be placed in existing fire roads.

Gas will require a new service from Edgemont Way. A 15ft. strip of land will be temporarily disturbed. The alignment is shown on ***Figure 1****.*

22) "Page 16, Section 2.2.1 Detailed Description of the Project, Proposed Construction Activities and Schedule: If construction details are not described in the specific activity sections they should be described here. If the construction and phasing changes where project effects change, the project will need to be reinitiated. This included habitat loss."

The timeframe to construct the various project components are reviewed in the detailed descriptions above. Details on the revised timeline for the overall construction schedule will be updated by the EBZS following further input from the resource agencies.

24) "Page 16, Section 2.2.1 Detailed Description of the Project, Ecological Recovery Zone:"

Refer to comment the answer to question 23.

28) Page 33, Section 5.1.3 Impacts Due to Fuel Management: Please provide a fuels management plan for this project. This section is too vague to fully analyze potential effects to individuals and habitat. On-going maintenance is considered a permanent effect to habitat. Will fuel management need to occur in other areas like the perimeter fence? Also, "take" as mentioned in the last sentence of this section is appears to be referring to the State definition of "take". The federal definition of take includes harm in the form of habitat loss and not just effects to individuals. This is an important distinction.

Please refer to the fire fuel management zones shown in Figures 1, 2, 3, 4, and 5, and the attached memo outlining a framework for vegetation management including SK-Arch-001.

memorandum

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To: East Bay Zoological Society
Cc: Darin Ranelletti, Planning and Zoning Division, City of Oakland
Leroy Griffin Assistant Fire Marshal, City of Oakland
Jim Martin, Environmental Collaborative
From: Ethan Ahlberg, Architect, Noll & Tam Architects
Date: November 7, 2012

Re: **Oakland Zoo California Trail**
Fire Fuel Management Plan Framework

This memorandum defines the framework for the required extent of fire fuel management associated with the California Trail expansion project at the Oakland Zoo. In general, fire fuel management will be required at all building and open air structures that will have human occupants and along roadways and pedestrian accessways. The zone in which fire fuel management will be required generally consists of a 30-foot zone from the exterior walls of structures, and a 10-foot zone from roadways and pedestrian accessways. Fire fuel management will not be required along fences, including the Perimeter Fence. Fire fuel management zones are shown on Figures 1, 2, 3, 4, 5, 6, and 7, prepared by the project engineer, Aliquot Associates, and SK-Arch-001.

This Fire Fuel Management Plan Framework was prepared based on a site walk conducted on July 30, 2012 with Leroy Griffin, Assistant Fire Marshal, Dr. Joel Parrott, the Zoo Director, and myself. This was followed by a meeting at City Hall on November 6, 2012 attended by Mr. Griffin, Darin Ranelletti from the City's Planning and Zoning Division, Jim Martin with Environmental Collaborative serving as project biologist, and myself. During the site walk conditions in the vicinity of the Visitor/Interpretive Center, access roads, and Overnight Experience were reviewed. During the follow-up meeting, details on required setback zones, fire fuel management implications, and relevant aspects of the City code were reviewed.

This Framework is considered a conservative approach to fire fuel management. According to Mr. Griffin, the fire fuel management zones may be refined/reduced upon review of the final Fire Fuel Management Plan and during consultation with the state and federal resource agencies. A major focus of the fire fuel management issues relate to the possible impacts on chaparral habitat, which occurs downslope and to the west of the Visitor/Interpretive Center. Refinements to the approved footprint of structures and gondola entrance to the Visitor Center were made during project design to minimize disturbance to areas of chaparral cover. Limited areas of chaparral cover will require fire fuel management on the west side of the Visitor Center, along the access road between the Overlook and Visitor Center, and along the access to the Overnight Experience. A summary of the fire fuel management requirements for the various aspects of the project are summarized below:

Visitor/Interpretive Center and Elevated Public Walkway Treatments:

Fire fuel management will be required within a zone of a maximum of 30 feet from the face of wall or column of the built structure of the Visitor Center and Elevated Walkway, shown as a dashed blue line on the attached **SK-Arch-001** dated November, 2012. The fire fuel management zone will not be measured from any deck or roof overhangs beyond the face of structure that meets the ground. The proposed 3rd floor deck on the southwest façade of the Visitor Center cantilever's 8 feet beyond the structure below, but is of concrete construction. Mr. Griffin has indicated that no additional setback from the cantilever deck is required given the proposed design featuring concrete construction for the bottom two levels of the structure, providing a 3 hour fire rating of all structure up to a height of 24 feet above grade, including the floor of the overhanging deck.

Vegetation Management within the fire fuel management zone will affect limited areas of chaparral cover, as indicated in **SK-Arch-001.** The edge of chaparral canopy was mapped by engineer survey, and is depicted in the figure by the dashed brown line, with areas of affected chaparral cover shown in hatching. An additional zone of chaparral will require routine pruning beyond this fire fuel management zone to provide gondola access into the building, which is also depicted in SK-ARCH-001 and reflected in cross-section **1** in **Figure 2a.**

Controls that would be implemented:

Where chaparral and scrub habitat falls within the identified fire fuel management zone, careful controls will be implemented to minimize disturbance to sensitive habitat. These consist of the following management methods and controls:

1. A biological monitor shall be present during shrub maintenance activities.
2. Shrub maintenance shall be done manually using chain saws and clippers.
3. No shrub stumps shall be removed.
4. Shrub cuttings shall be removed from the area.
5. Thinning shall not result in shrub cover of less than 25%.
6. Thinning shall not be performed more frequently than on an annual basis.
7. Shrubs will be trimmed down to 18" inches height and trees within the zone will have limbs trimmed up to 6 feet in height.

Roadway and Access Treatments:

As indicated by Mr. Griffin during the meeting on November 6, 2012, the fire fuel management zone along the access road to the Visitor/Interpretive Center and access to the Overnight Experience is limited to a 10-foot setback area from the roadway edge. Vegetation management in this 10-foot setback area will focus on removal of French broom and other invasive species, limbing of all trees up to a minimum of 6 feet off the ground, maintenance of grassland cover to a height of six inches, and limited thinning of native chaparral and shrub species where they fall within the 10-foot setback zone. Where native chaparral and scrub vegetation could be affected, the management controls listed above under treatments for the Visitor/Interpretive Center would apply as well. Refer to **Figures 1, 3, 4, 5, 6, 7, and SK-Arch-001.**

Zoo Overnight Experience Area:

Fire fuel management will be required within the circle of platform structures in the overnight experience area, and to 30 feet outside the perimeter of the platform structures. This includes limbing of trees up to a minimum of 6 feet off the ground, and maintenance of grassland cover to a height of six inches. Refer to **Figure 5**.

The above provides a framework for the required fire fuel management activities to be implemented as part of the California Trails project, and the limits of vegetation that could be affected under the management zones. A detailed Fire Fuel Management Plan will be prepared following input from the resource agencies, and further direction from the City Fire Department. The final Fire Fuel Management Plan will provide additional information on methods, schedule, and reporting requirements, among other details.

Please contact me at 510.542.2200 if you have any questions.

Kind Regards,

Ethan Ahlberg
Architect

Noll & Tam Architects
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PERIMETER FENCE

OVERNIGHT EXPERIENCE

VISITOR CENTER

INTERPRETIVE CENTER

GONDOLA TOWER 6

GONDOLA TOWER 5

OVERHEAD GONDOLA LINE

GONDOLA TOWER 4

GONDOLA TERMINAL

BISON/TULE ELK

INTERPRETIVE OVERLOOK

TRENCHED UTILITIES

VETERINARY MEDICAL HOSPITAL

14' MAINTENANCE ACCESS ROAD

PERIMETER FENCE

WOLF

EAGLE

CONDOR

JAGUAR

GRIZZLY BEAR

BLACK BEAR

MOUNTAIN LION

SNOWDOWN

E.V.A.

RESTROOM

PUBLIC ACCESS PATH

BEAVER/ WATERFOWL

FIRE ACCESS ROAD (D) SHALL REMAIN THROUGHOUT CONSTRUCTION

SNOWDOWN AVE

EDGEMONT WAY

0 120 240 480

(IN FEET)
1 inch = 240 ft.

LEGEND

- BUILDING
- RETAINING WALL
- STREET/WALKWAY
- GRADED AREAS
- TEMP. CONSTRUCTION ACCESS
- (F) EXISTING FIRE ROAD
- CONSTRUCTION STAGING AREA
- FIRE FUEL MANAGEMENT LINE*
- ELEVATED BOARDWALK
- G — G ANIMAL EXHIBIT FENCE
- X — X PERIMETER FENCE

*SEE MEMORANDUM FOR FIRE FUEL MANAGEMENT PLAN, ENCLOSED.

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Planners
Civil Engineers
Surveyors

No.	BY	DATE	REVISIONS

OVERALL SITE EXHIBIT
CALIFORNIA TRAILS EXHIBIT
KNOWLAND PARK-OAKLAND ZOO

JOB NO 206022
SCALE
DATE 11/7/2012
DESIGN
DRAWN
APPROVED

DRAWING NUMBER

FIG 1
1 OF 1

0 30 60 120

(IN FEET)
1 inch = 60 ft.

BRISTLY LEPTOSIPHON

WOLF

ELEVATED BOARDWALK

WOLF HOLDING

SEE FIG SK-Arch-001
FOR MORE DETAIL

WOLF

VISITOR CENTER

GONDOLA TOWER

EAGLE

CONSTRUCTION STAGING AREA

CONSTRUCTION STAGING AREA

BRP
(MULTI)

CONDOR

JAGUAR

JAGUAR

1'-22' WALL

1'-12' WALL

1'-9' WALL

JAGUAR HOLDING

BRP

5'-16' WALL

LIMIT OF
CHAPARRAL

CONSTRUCTION STAGING AREA

5' WALL

BRP

GRIZZLY HOLDING

GRIZZLY

CONSTRUCTION STAGING AREA

1'-6' WALL

1'-6' WALL

INTERPRETIVE CENTER

RESTROOM

LEGEND

- BUILDING
- RETAINING WALL
- STREET/WALKWAY
- BIORETENTION PLANTER (BRP)
- GRADED AREAS
- TEMP. CONSTRUCTION ACCESS
- FIRE FUEL MANAGEMENT LINE*
- ELEVATED BOARDWALK
- G — ANIMAL EXHIBIT FENCE
- X — PERIMETER FENCE

*SEE MEMORANDUM FOR FIRE FUEL MANAGEMENT PLAN, ENCLOSED.

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No.	BY	DATE	REVISIONS

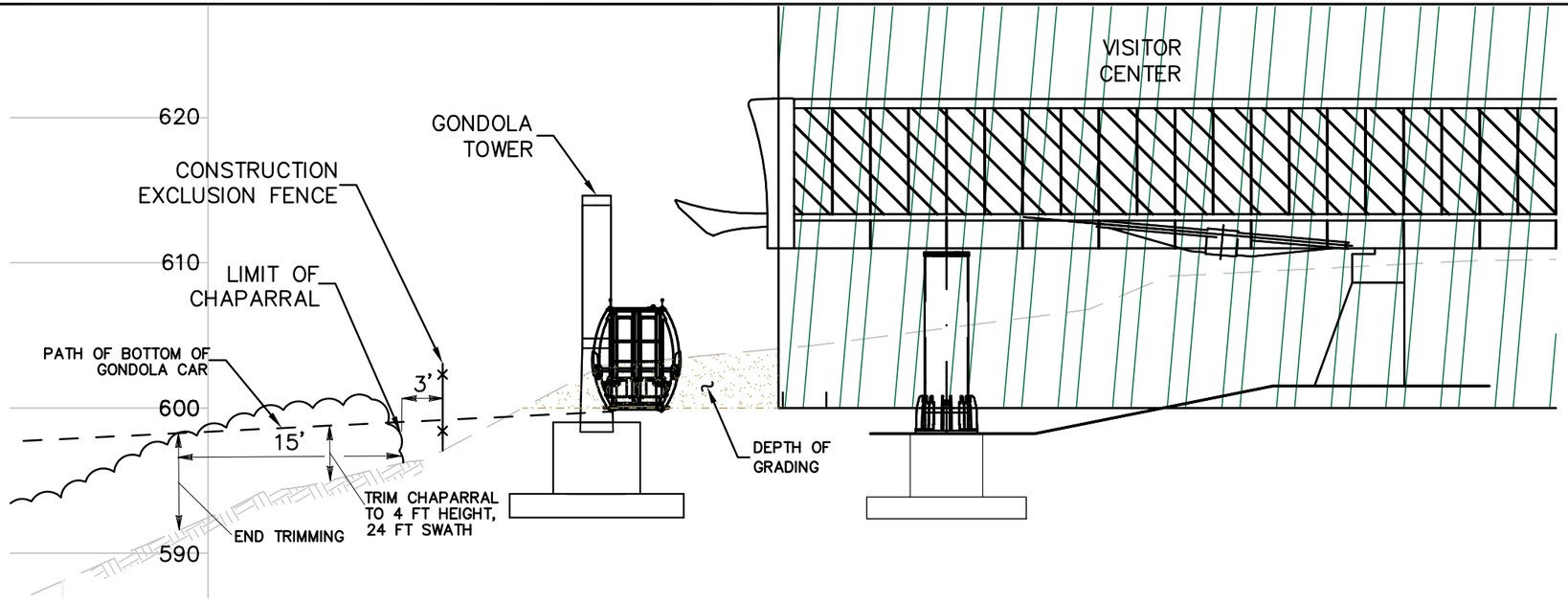
SITE EXHIBIT

CALIFORNIA TRAILS EXHIBIT
KNOWLAND PARK-OAKLAND ZOO

JOB NO	SCALE	DATE	DESIGN	DRAWN	APPROVED
208022		11/7/2012			

DRAWING NUMBER

FIG 2
1 OF 1



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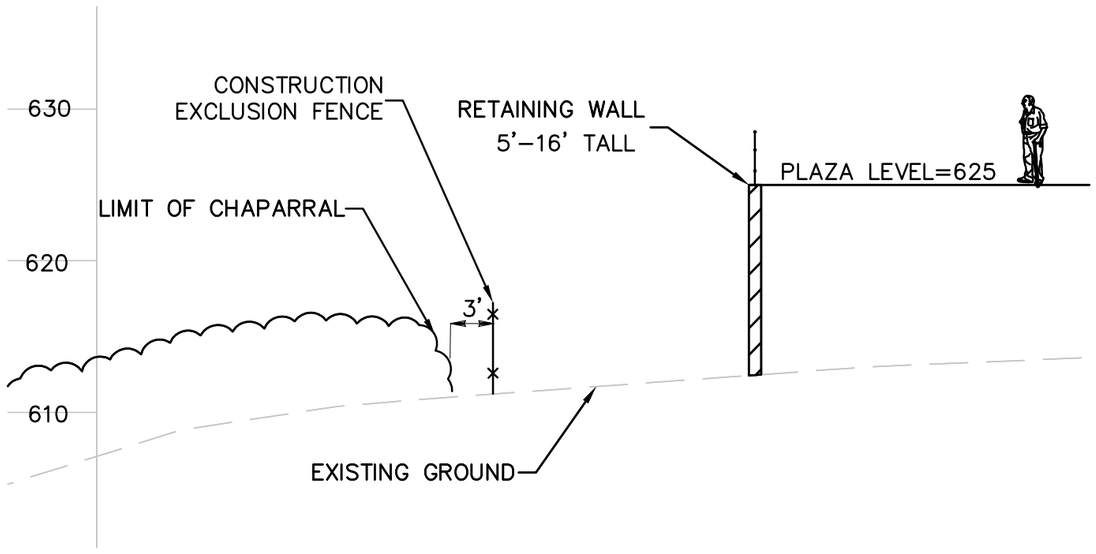

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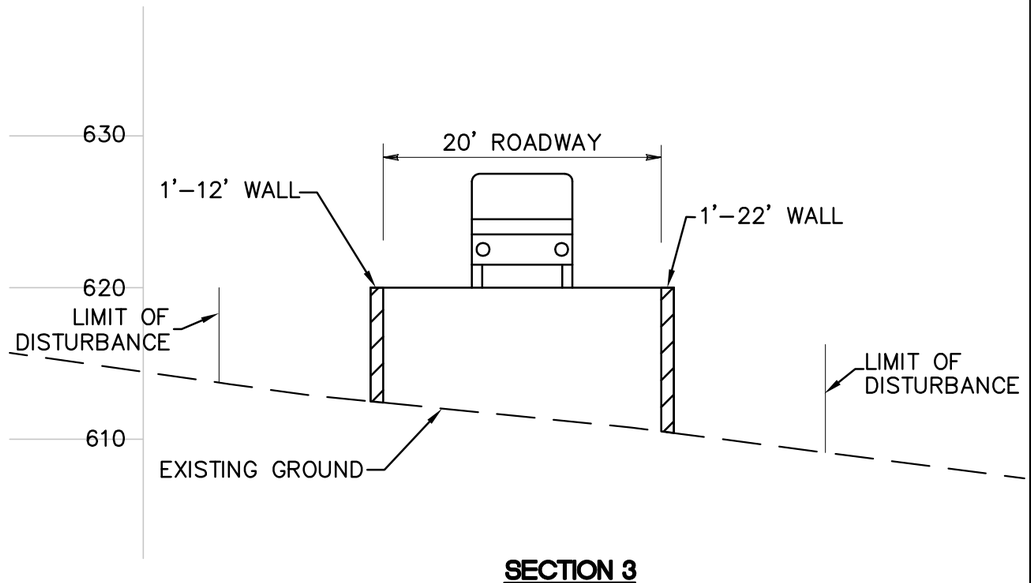

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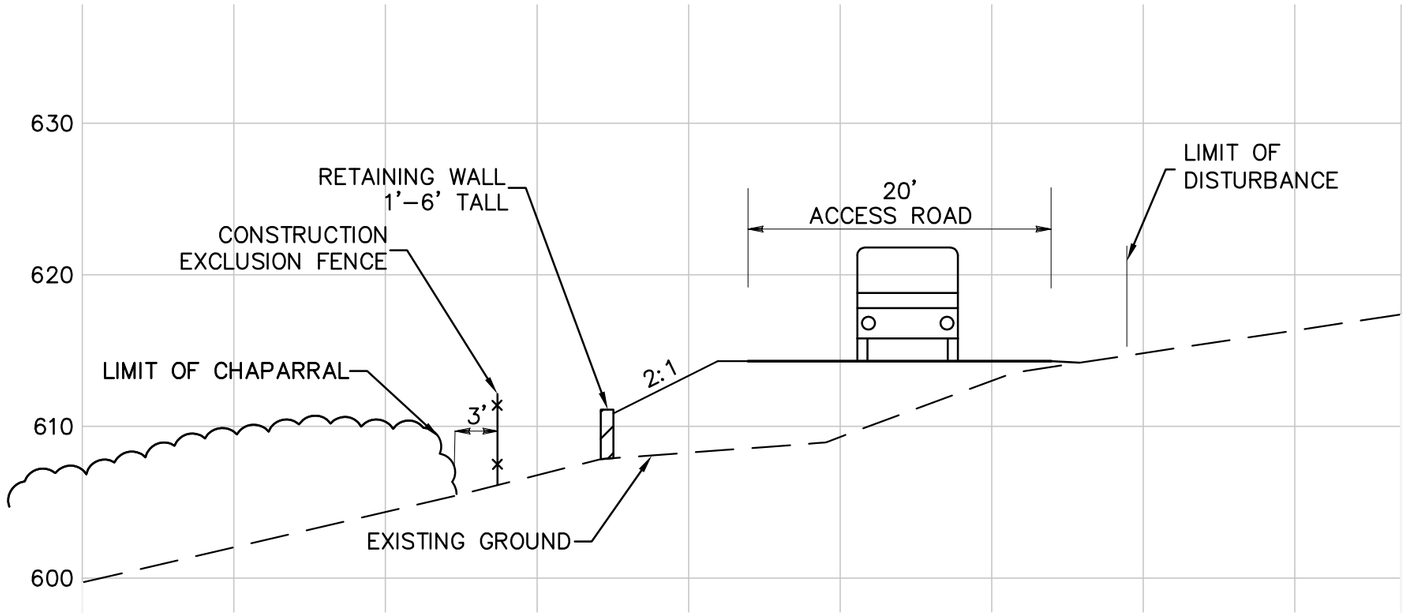
No.	BY	DATE	REVISIONS

SECTIONS
CALIFORNIA TRAILS EXHIBIT
KNOWLAND PARK-OAKLAND ZOO

JOB NO 208022
SCALE
DATE 10/17/2012
DESIGN
DRAWN
APPROVED

DRAWING NUMBER
FIG 2a
1 OF 1



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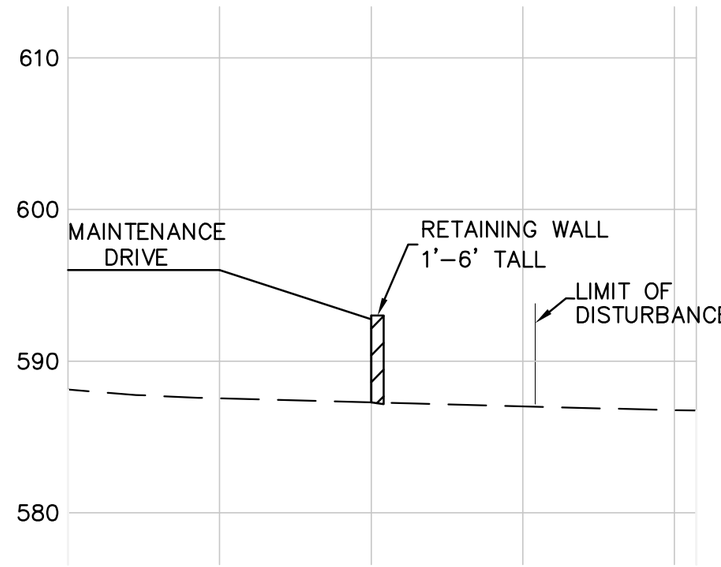

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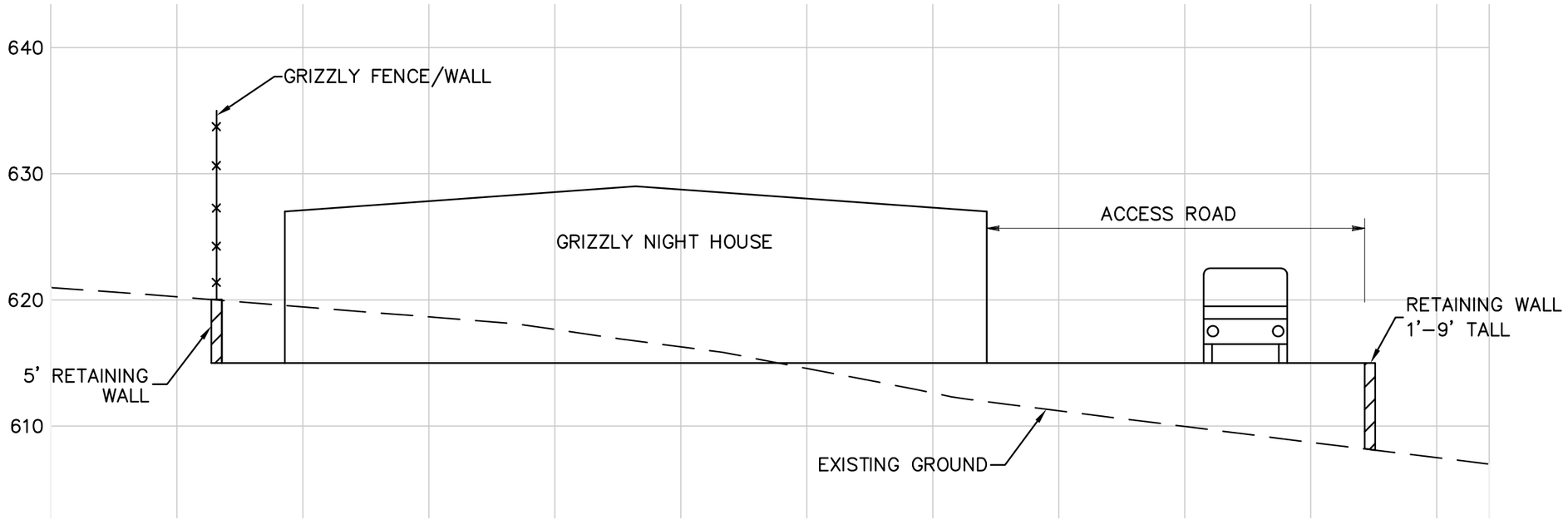
H: 1"=10'
V: 1"=10'



SECTION 5
H: 1"=10'
V: 1"=10'

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SECTIONS
CALIFORNIA TRAILS EXHIBIT
KNOWLAND PARK-OAKLAND ZOO

JOB NO 208022	SCALE	DATE 10/17/2012	DESIGN	DRAWN	APPROVED

DRAWING NUMBER
FIG 2b
1 OF 1

GRIZZLY

GRIZZLY VIEWING

GRIZZLY

GRIZZLY VIEWING

BRP

BEAVER/ WATERFOWL

ACTIVITY ZONE

BRP

BRP

BRP

BRP

BRP

MOUNTAIN LION HOLDING

4'-5' WALL

INTERPRETIVE OVERLOOK

BLACK BEAR HOLDING

BLACK BEAR

MOUNTAIN LION

BLACK BEAR

EQUIP. STORAGE

0 30 60 120

(IN FEET)
1 inch = 60 ft.

LEGEND

- BUILDING
- RETAINING WALL
- STREET/WALKWAY
- FIRE FUEL MANAGEMENT LINE*
- GRADED AREAS
- TEMP. CONSTRUCTION ACCESS
- ELEVATED BOARDWALK
- BIORETENTION PLANTER (BRP)
- MOAT/PIT
- ANIMAL EXHIBIT FENCE
- PERIMETER FENCE

*SEE MEMORANDUM FOR FIRE FUEL MANAGEMENT PLAN, ENCLOSED.

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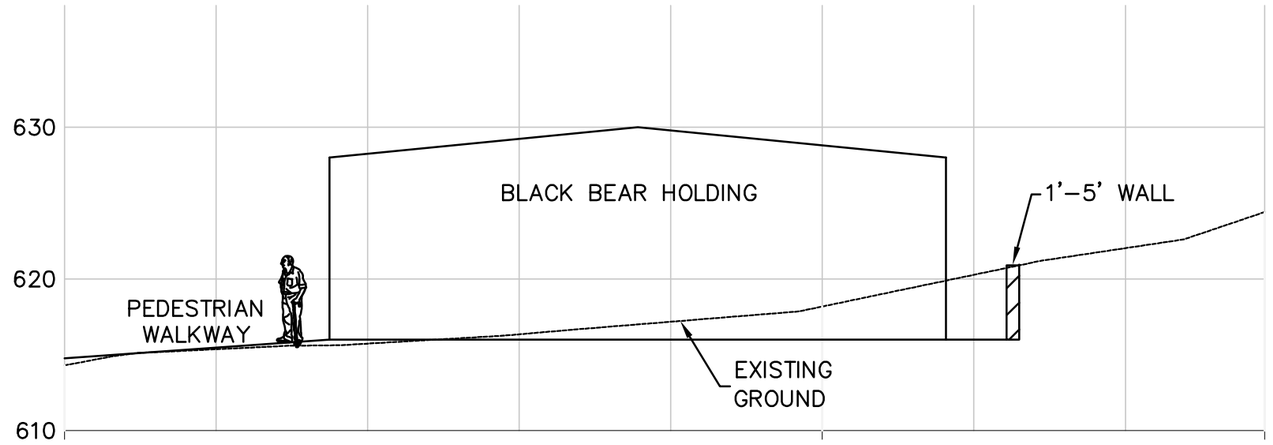
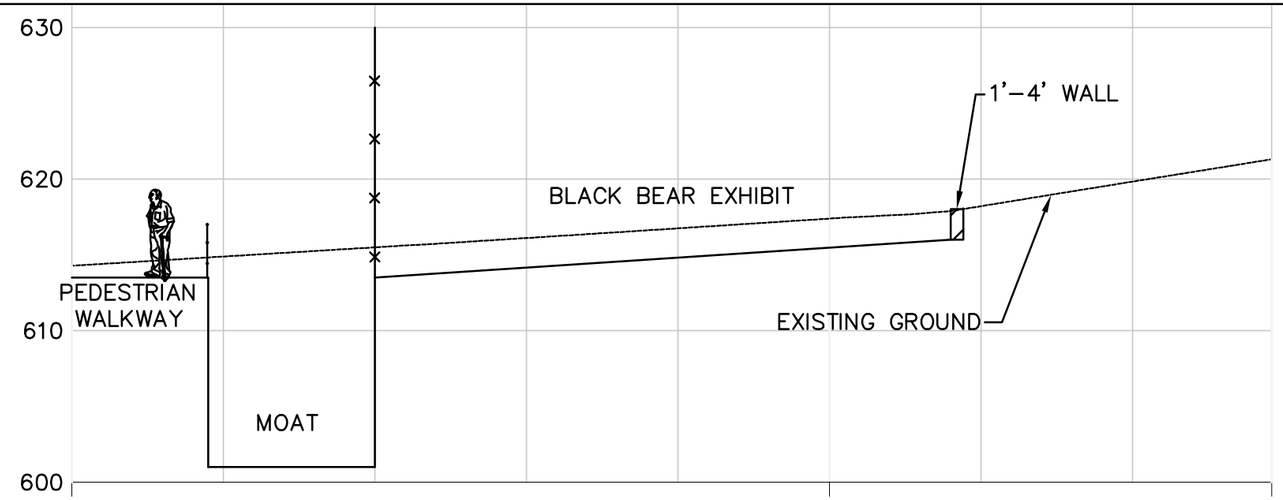
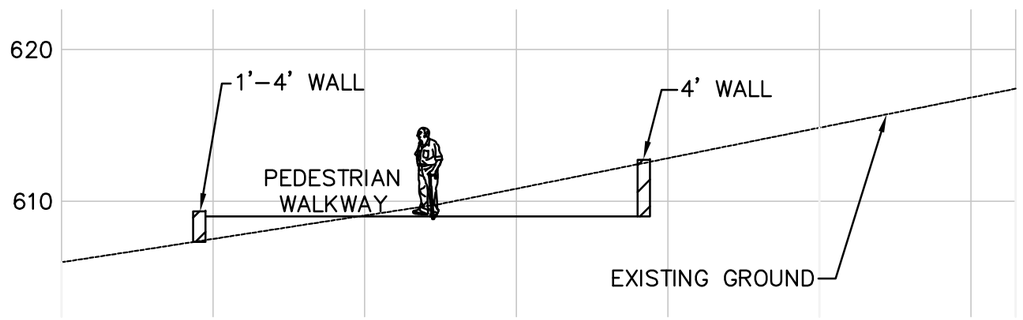
FIG 3
1 OF 1



SECTION 7
H: 1"=10'
V: 1"=10'



SECTION 8
H: 1"=10'
V: 1"=10'



SECTION 9
H: 1"=10'
V: 1"=10'

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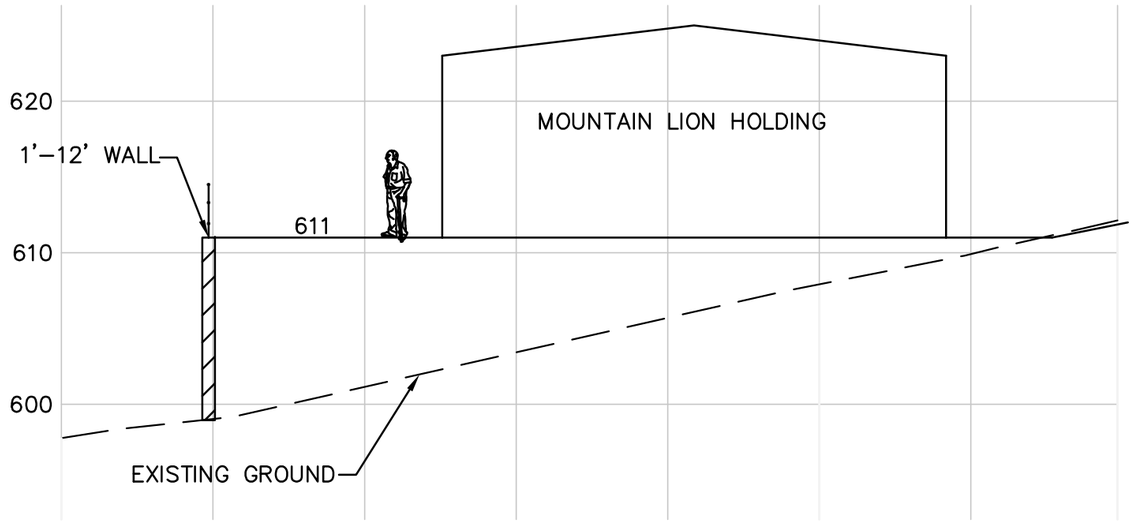
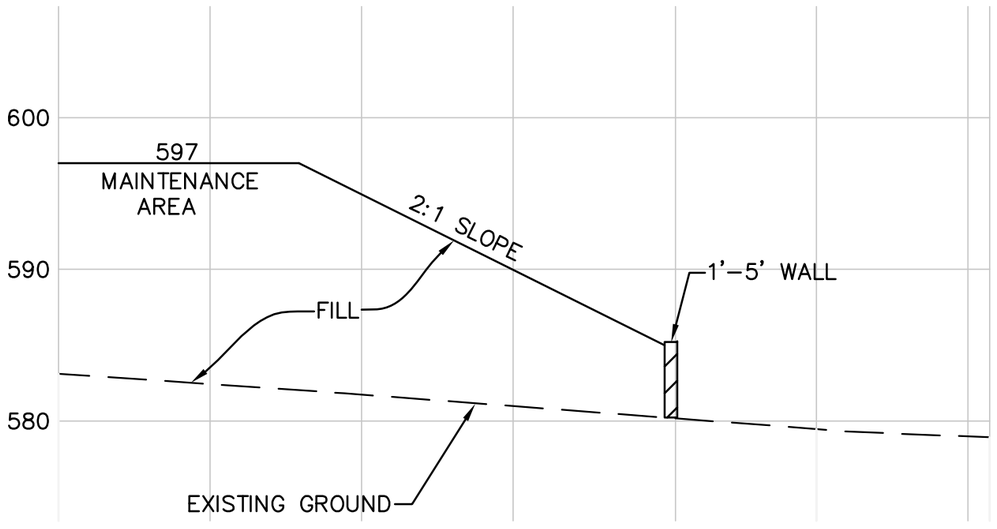
FIG 3a
1 OF 1



SECTION 10
H: 1"=10'
V: 1"=10'



SECTION 11
H: 1"=10'
V: 1"=10'

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FIG 3b
1 OF 1

0 60 120 240

(IN FEET)
1 inch = 120 ft.

GONDOLA TERMINAL/
VISITOR CENTER

GONDOLA TOWER 7

GONDOLA TOWER 6

GONDOLA TOWER 5

GONDOLA TOWER 4

GONDOLA TOWER 3

GONDOLA TOWER 2

GONDOLA TOWER 1

GONDOLA TERMINAL

OVERHEAD GONDOLA LINE

FIG 4b
SEE SECTION

FIG 4a
SEE SECTION

FIG 4a
SEE SECTION

300'

180'

BRP

TRENCHED UTILITIES

LEGEND

- BUILDING
- RETAINING WALL
- STREET/WALKWAY
- GRADED AREAS
- TEMP. CONSTRUCTION ACCESS
- BIORETENTION PLANTER (BRP)
- ELEVATED BOARDWALK
- FIRE FUEL MANAGEMENT LINE*
- G — ANIMAL EXHIBIT FENCE
- X — PERIMETER FENCE

*SEE MEMORANDUM FOR FIRE FUEL MANAGEMENT PLAN, ENCLOSED.

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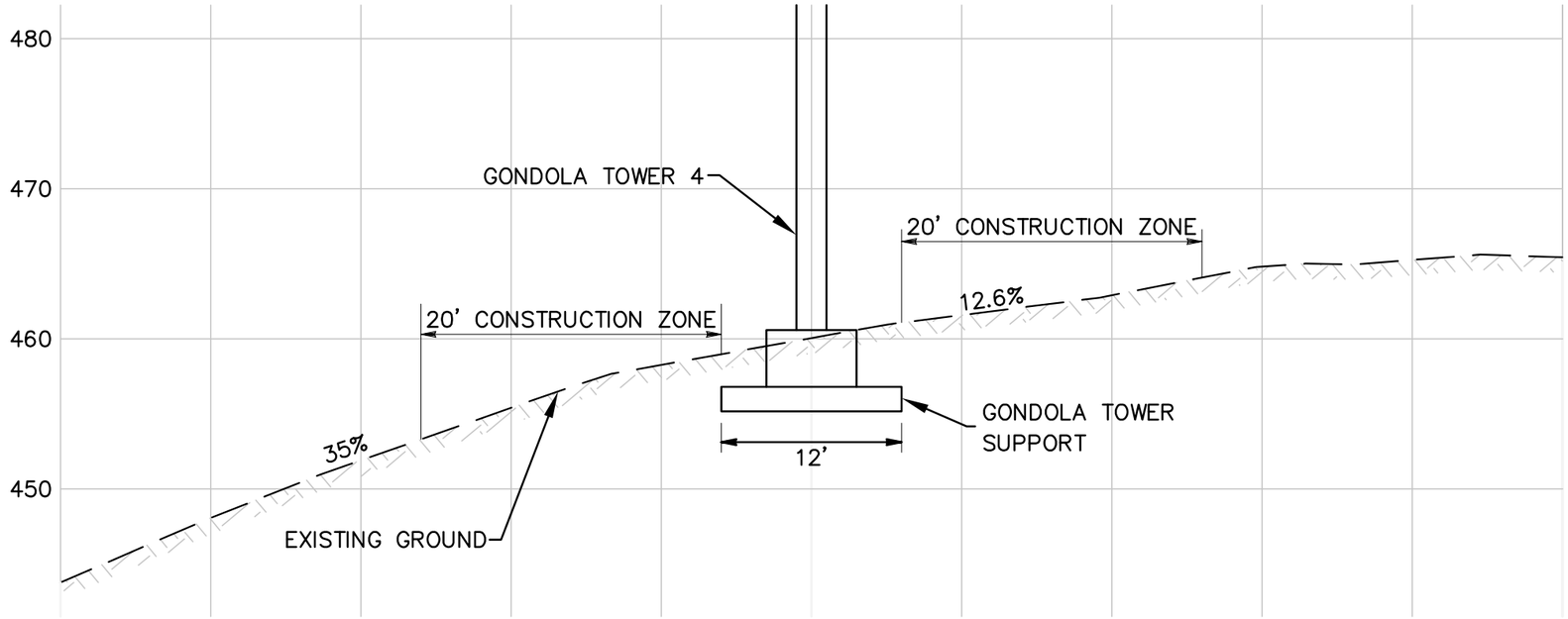
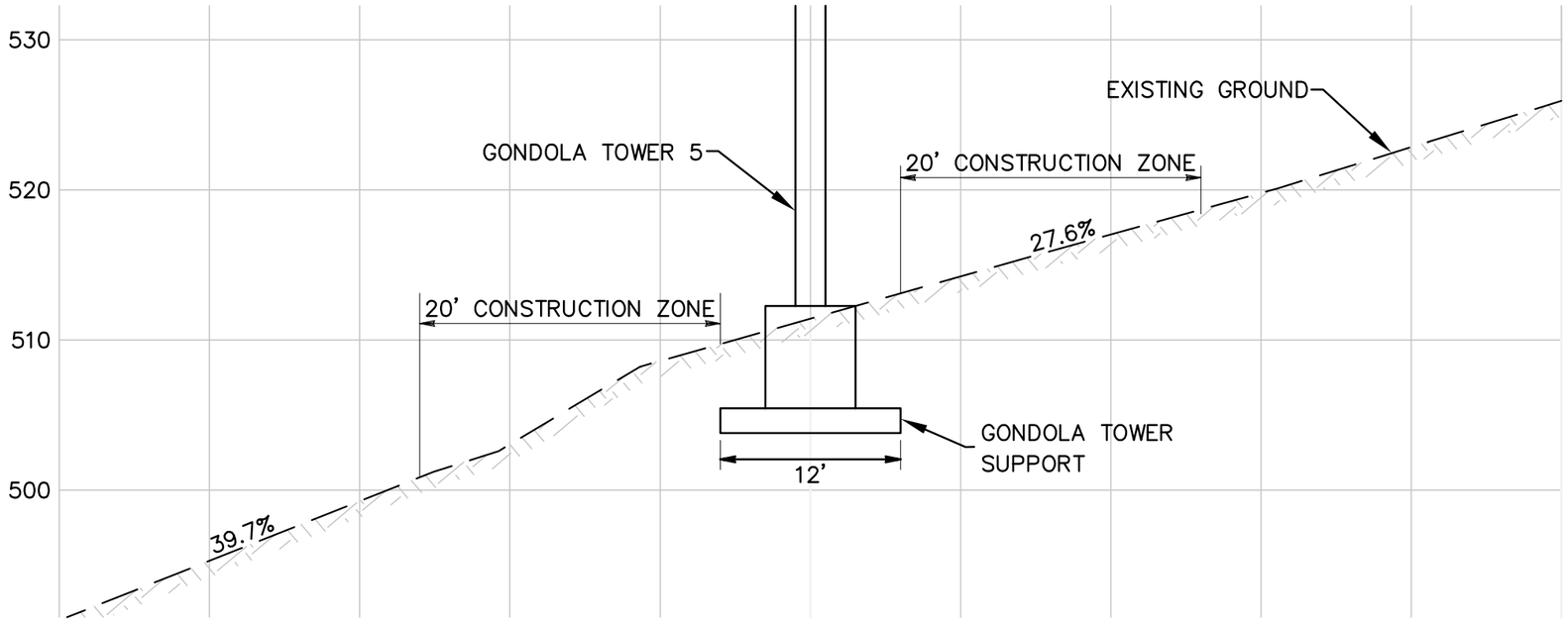
FIG 4
1 OF 1



SECTION: GONDOLA TOWER 4

H: 1"=10'
V: 1"=10'



SECTION: GONDOLA TOWER 5

H: 1"=10'
V: 1"=10'

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GONDOLA TOWER SECTIONS
CALIFORNIA TRAILS EXHIBIT
KNOWLAND PARK-OAKLAND ZOO

JOB NO 208022
SCALE
DATE 10/17/2012
DESIGN
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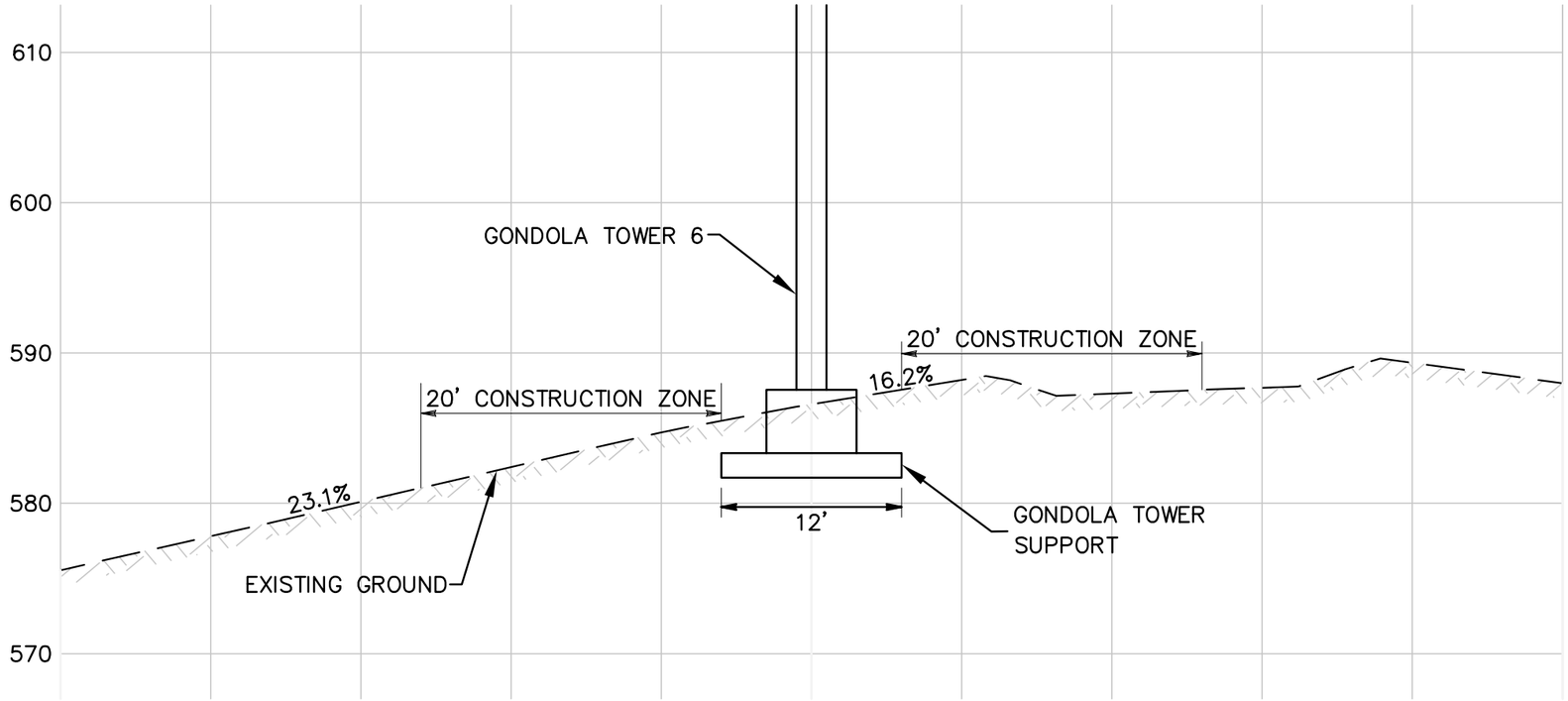
DRAWING NUMBER

FIG 4a

1 OF 1



SECTION: GONDOLA TOWER 6

H: 1"=10'
V: 1"=10'

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DRAWING NUMBER

FIG 4b

1 OF 1

0 30 60 120

(IN FEET)
1 inch = 60 ft.

OVERNIGHT EXPERIENCE

OVERHEAD GONDOLA LINE

LEGEND

- BUILDING
- RETAINING WALL
- STREET/WALKWAY
- GRADED AREAS
- FIRE FUEL MANAGEMENT LINE*
- G — ANIMAL EXHIBIT FENCE
- X — PERIMETER FENCE

*LIMB TREES, TRIM BRUSH, AND MOW GRASS WITHIN FIRE FUEL MANAGEMENT LINE

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SITE EXHIBIT
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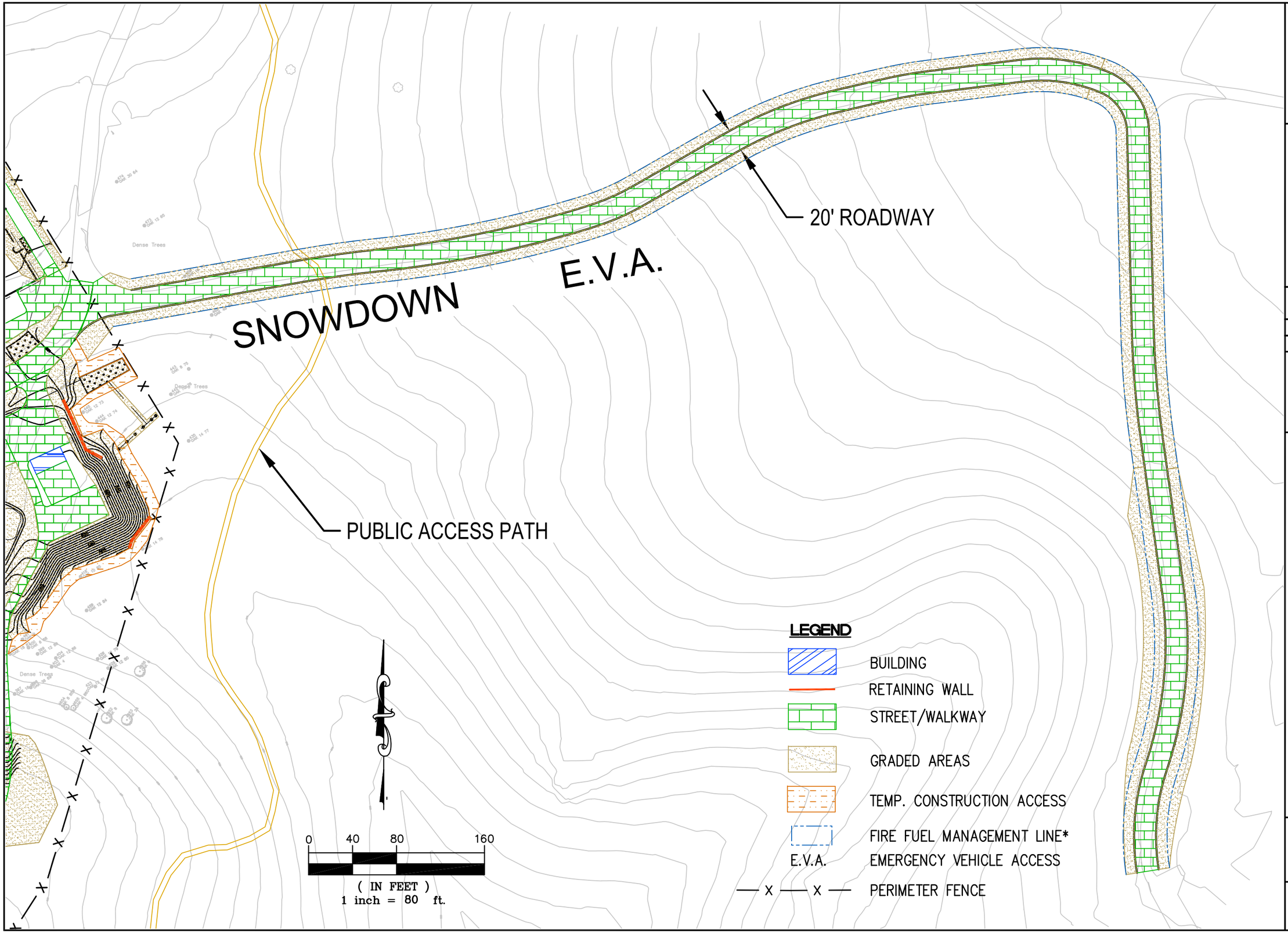
DRAWING NUMBER
FIG 5
1 OF 1



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SITE EXHIBIT-SNOWDOWN EVA
CALIFORNIA TRAILS EXHIBIT
KNOWLAND PARK-OAKLAND ZOO

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FIG 6
1 OF 1

TRENCHED UTILITIES

BRP

14 FT WIDE MAINTENANCE ACCESS ROAD

BRP

BRP

BRP

5/7a

4/7a

3/7a

2/7a

1/7a

0 60 120 240

(IN FEET)
1 inch = 120 ft.

LEGEND

- BUILDING
- RETAINING WALL
- STREET/WALKWAY
- GRADED AREAS
- TEMP. CONSTRUCTION ACCESS
- BIORETENTION PLANTER (BRP)
- ELEVATED BOARDWALK
- FIRE FUEL MANAGEMENT LINE*
- ANIMAL EXHIBIT FENCE
- PERIMETER FENCE

*SEE MEMORANDUM FOR FIRE FUEL MANAGEMENT PLAN, ENCLOSED.

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MAINTENANCE ACCESS ROAD
CALIFORNIA TRAILS EXHIBIT
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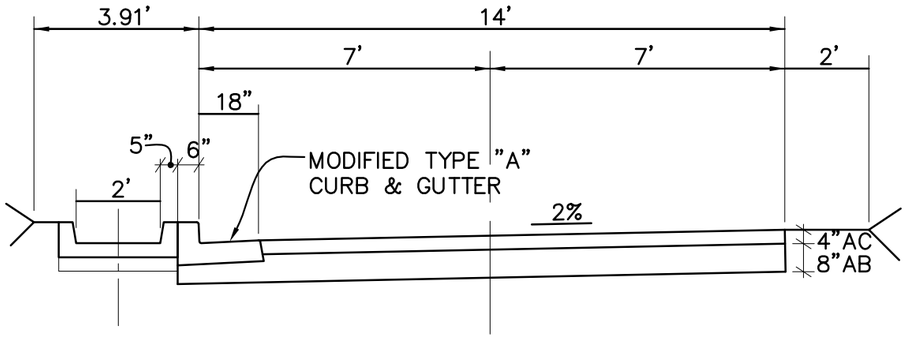
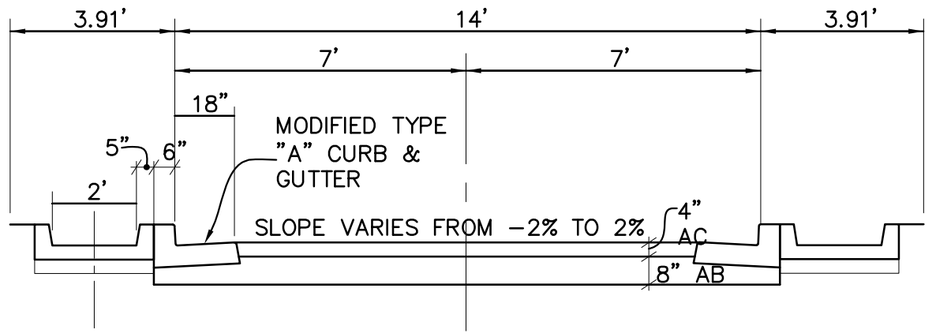
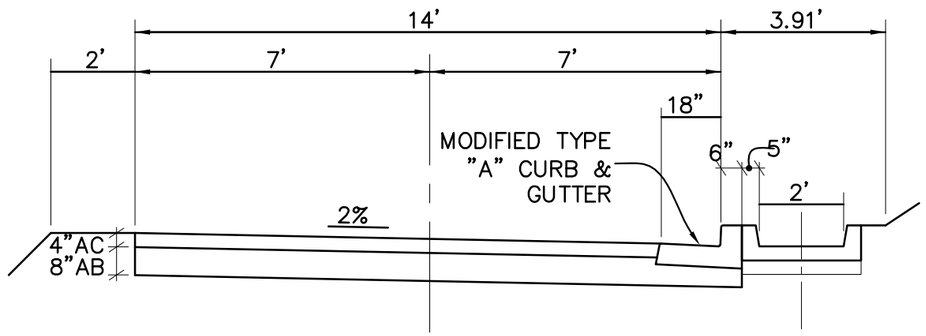
FIG 7
1 OF 1



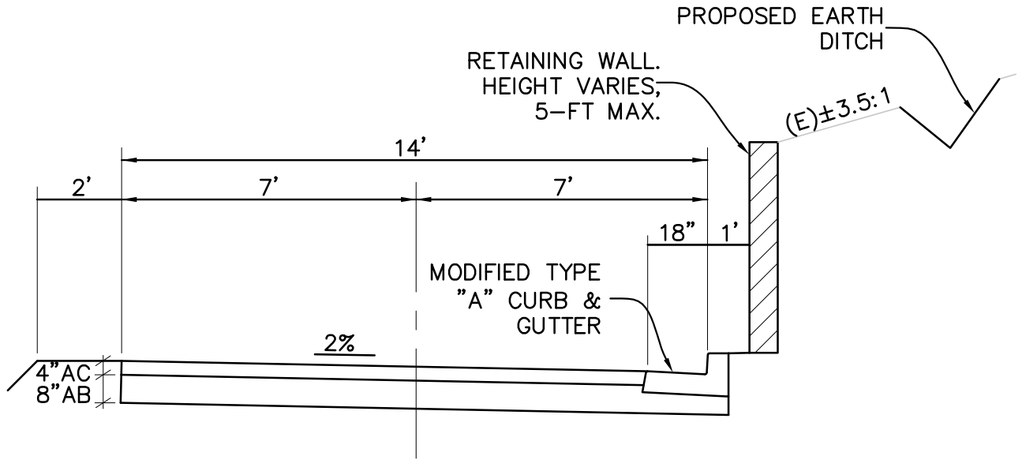
ROAD SECTION 1



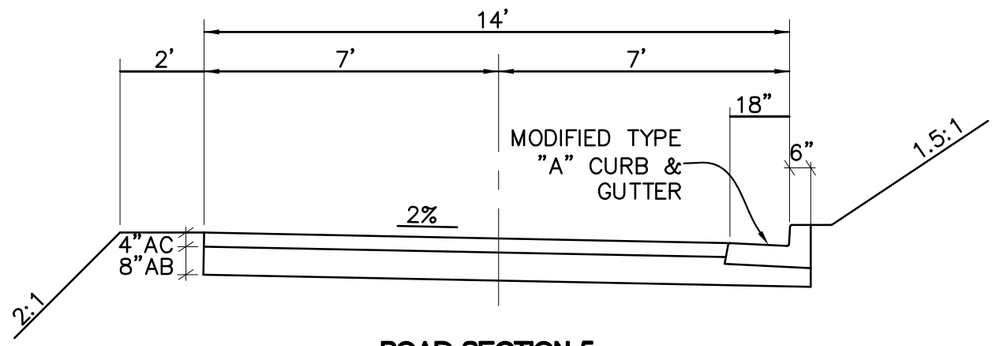
ROAD SECTION 2



ROAD SECTION 3



ROAD SECTION 4



ROAD SECTION 5

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MAINTENANCE ACCESS ROAD SECTIONS
CALIFORNIA TRAILS EXHIBIT
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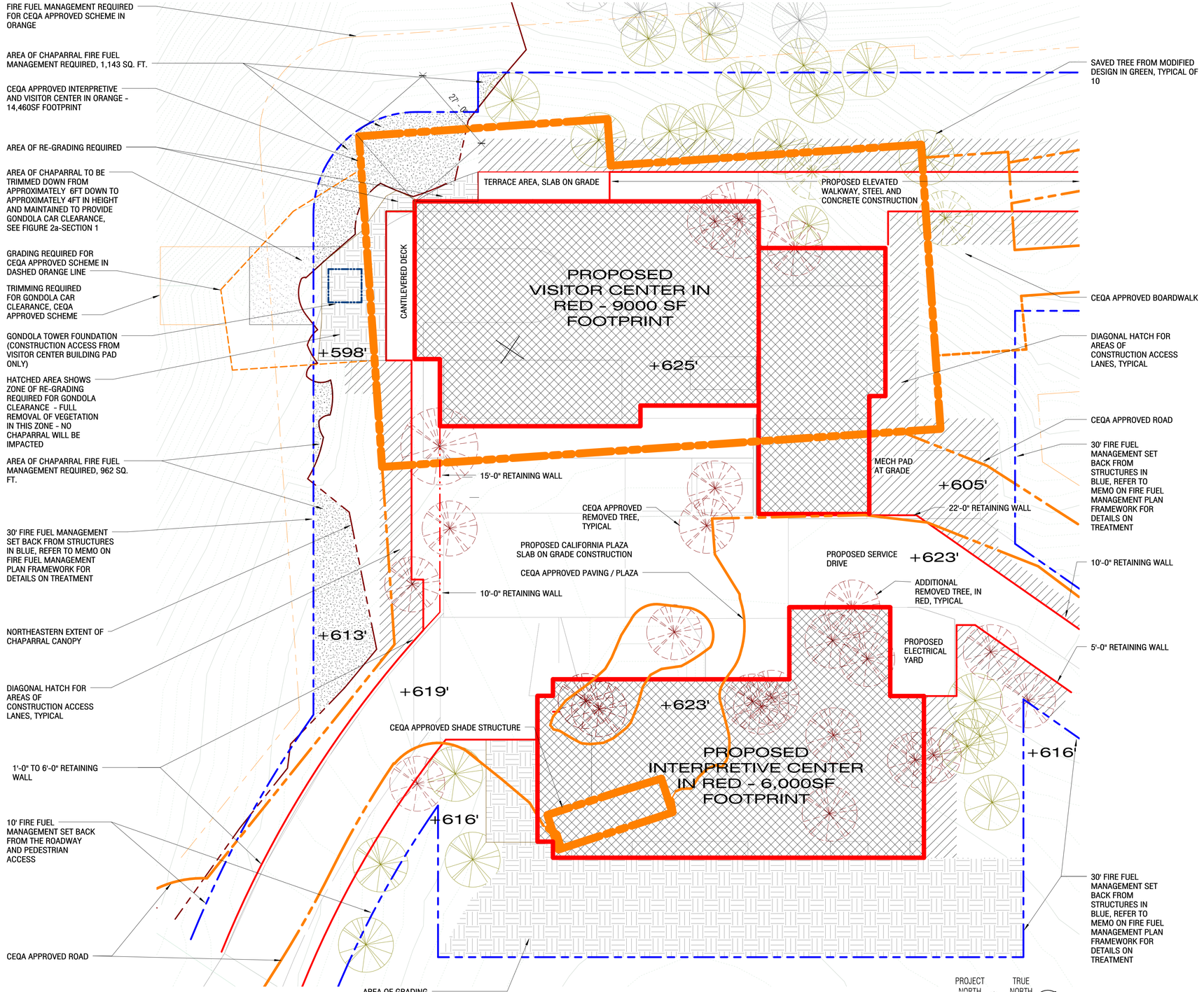
FIG 7a
1 OF 1



SITE PLAN - FIRE FUEL MANAGEMENT DIAGRAM

1/16" = 1'-0"

Oakland Zoo
CALIFORNIA TRAIL PHASE 1

FIRE FUEL MANAGEMENT PLAN AND DESIGN DEVELOPMENT DIAGRAM

SK-Arch-001

NOVEMBER 2012

noll & tam architects and planners