TETRA TECH EC, INC.

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California Energy Commission
Docket No. 09-AFC-8
1516 9th St.
Sacramento, CA 95814

Genesis Solar Energy Project - Docket Number 09-AFC-8

Docket Clerk:

Pursuant to the provisions of Title 20, California Code of Regulation, Genesis Solar LLC, a Delaware limited liability company, hereby submits the *Genesis Solar Energy Project Application for Certification Data Adequacy Supplement 1A*. The Genesis Solar Energy Project is a 250 megawatt solar electric generating facility to be located between the community of Desert Center and the city of Blythe in eastern Riverside County, California.

This data adequacy supplement was compiled in response to comments on the Energy Commission's Data Adequacy Recommendation (09-AFC-8) dated September 30, 2009. This document provides the additional information necessary to fulfill the Application for Certification data adequacy requirements for the following technical areas:

- Water Resources

If you have any questions, please contact Meg Russell at (561) 304-5609 or me at (303) 980.3727.

Sincerely,

Tricia Bernhardt
Project Manager/Tetra Tech EC

cc: Mike Monasmith /CEC Project Manager

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Genesis Solar Energy Project

09-AFC-8

Data Adequacy Supplement 1A- Drainage Design Narrative/Work Plan

October 26th, 2009

Introduction

Genesis Solar, LLC, is proposing a Solar Thermal Power Generating Project to be built near Ford Dry Lake in Riverside County, State of California by NextEra Energy Resources. The Project Site ("Site") will be located in the Sonoran Desert between the communities of Blythe, CA (approximately 25 miles east) and Desert Center, CA (approximately 27 miles west).

An Application for Certification (AFC) was submitted to the California Energy Commission (CEC) in August 2009 which included a Drainage, Erosion and Sediment Control Plan (DESCP). The DESCP included a conceptual drainage study, which evaluated the drainage shed of the Site, the off-site flows hitting the Site, and the existing grading and drainage patterns associated with pre-developed conditions and the future post development grading requirements and drainage flows through and around the Site.

This write up contains a brief summary of the drainage patterns that currently exist on-site as well as the post-project flow patterns proposed, a summary of the drainage design work already undertaken and provided to the CEC, and further assessments to be undertaken that will be submitted after Data Adequacy and prior to detailed design.

To aid in the understanding of the further assessments, a narrative of the pre-project flow patterns and the post-project flow patterns, and maps of each are provided in this Supplement 1A.

Completed Assessments

The conceptual drainage study contained an evaluation of the hydrology, hydraulic and grading aspects of the development. In summary, the main outcomes from this study were:

(a) **Determination of the drainage watershed boundary for the Site (including off Site sources)**:
Watershed boundaries were sourced from available state watershed information, contour intervals, USGS quadrangle maps, and available soils mapping information. In desert washes, catchment boundaries are known to continually shift over time based on the ground conditions, intensity of the storm event, velocity of the flow and sediment transportation.

The boundary selected for this study was based on existing information as future changes in the upstream catchment can not be predicted. The total watershed modeled encompasses 93,182 acres of which 91,696 acres are off-Site.

(b) **Determination of the quantity of stormwater run-off entering the Site**:
Site visits and aerial photography show that stormwater crosses the Project Site in a broad, relatively level, valley axial drainage that is about 3 ½ miles wide and generally characterized by subdued bar and swale morphology indicative of a depositional surface under sheet flood conditions. Numerous ephemeral washes, ranging from small, weakly expressed features to broad (over 10 feet wide), shallow features have been observed at the Site (refer to Appendix C.1 of the AFC, "Survey for Jurisdictional Waters and Wetlands at the Genesis Solar Energy Project, Eastern Riverside County, California", which includes a location map of 29 washes). A majority of these washes terminate prior to reaching Ford Dry Lake and transition into broad, shallow surface flow..

(c) Determination the quantity of stormwater run-off within the Site under pre-developed conditions:
United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS formerly SCS) Technical release 55 (TR-55) was the method used to determine the amount of stormwater runoff in a 100 year 24 hour storm event. These procedures are applicable to small watersheds within the United States. The TR-55 method converts rainfall to runoff using a runoff curve number (CN). Major factors that determine the CN are the hydrologic soil group, cover type and hydrologic conditions.

In a 100 year, 24 hour storm event, the flow of stormwater from the upstream catchment ranges from approximately 2,000 cubic feet per second (cfs) to 6,500 cfs (there are three upstream catchments which intersect the Project Site). Within the project Site, there is a stormwater run off rate of approximately 520 cfs and 420 cfs for each solar module unit.

(d) Determination the quantity of stormwater run-off within the Site under post-developed conditions:
Using the TR-55 method, the quantity of stormwater within the Project Site was assessed to be approximately 1300 cfs and 1200 cfs for each solar module unit.

Under post-developed conditions, it is proposed to divert the off-Site watershed in three channels:

- *Flows from the sub-basin 1 (north-western) will be diverted through a channel on the west side of the west 125 MW module;*
- *Flows from sub-basin 2 (north) will be diverted through a channel between the two 125 MW modules; and*
- *Flows from sub-basin 3 (north-eastern) will be diverted though a channel along the east side of the east 125 MW module.*

All these three main channels will divert flows downstream of the Site following their existing drainage paths, causing no impact to the Site. The use of drainage channels alters the

existing stormwater flow pattern from sheet flowing across the Site.. However the main purposes of the diversion are to prevent interaction with off-Site stormwater and on-Site stormwater which will:

- *Allow natural groundwater recharge of the off-Site stormwater with no contact with the changed flow conditions of the on-Site water;*
- *Protect the Site infrastructure from flash flood events, which have the potential to damage the solar parabolic troughs;*
- *Control treatment of the on-Site flows from the solar collector array (location of heat transfer fluid within the solar parabolic troughs);*
- *Protect the Site from upstream sediment loading;*
- *Control on-Site flows in detention basin to ensure there is no increase in post-developed flow discharging from the Site, minimizing the impact on downstream drainage features (lake playas etc), and*
- *Maximize the developable area within the solar field.*

(e) Evaluation of the difference in stormwater run-off quantities between pre-developed and post developed conditions and estimate the required size of on Site detention basins:

Preliminary volumes required for the detention basins are 66 acre-feet for the 125MW module in the west, and 49 acre-feet for the 125MW module in the east. These volumes are based on the detention ponds receiving the 100 year, 24 hour event post-development runoff from the Site, and then discharging the run-off at the pre-developed rate into the existing drainage system. The Riverside County Best Management Practice Manual requires extended detention basins to release runoff over a 48 hour draw down period, and the outlet sized to retain the first half of the design volume for a minimum of 24 hours.

(f) Determination of the alignment and preliminary sizing of drainage channels within the Site to facilitate stormwater run off:

Drainage channels will be provided within the solar fields to route stormwater run off to the detention basins. These channels will have an approximate base width of 10 feet and a depth of 1 foot, with side slopes at 5:1.

(g) Determination of the alignment and preliminary sizing of drainage channels outside of the Site to facilitate stormwater run off:

Preliminary drainage channels were designed using Bentley's FlowMaster software and sized to ensure that the all stormwater runoff in a 100 year, 24 hour can be accommodated along the alignments shown.

(h) Determination of the preliminary grading requirements on Site to facilitate the storm water run off into the drainage channels and detention basin(s):

The conceptual grading plan (shown in the Conceptual Drainage Study), includes the finished grade elevations and preliminary contour lines across the entire Site.

Grading for post-developed conditions will slightly modify the existing contours to provide a surface level appropriate for the parabolic troughs. The preliminary grading is designed to

ensure that the run off from solar fields is directed into the appropriate drainage channel, and that the power block, evaporation ponds and land farm units are protected in the 100 year, 24 hour storm event.

Drainage Narrative

The purpose of this narrative is to describe the storm flow (particularly the 100-year stream flow) that crosses the Site including:

1) The pre-project conditions, including the number of existing primary channels, the flow associated with each, the morphology of the flow patterns/channels, anticipated flow levels, and factors affecting flow distribution; and
2) The condition of the flows entering the Site, flowing through the Site, and exiting the Site

There are no FEMA defined floodplains or floodways entering the up-gradient portion of the Site. The up-gradient flows enter the project as numerous small braided channels and sheet flow (see attached Figure 1, Map of Pre-Project 100 year Flow Paths). The flow in each channel and across the north portion of the Site is dependent upon the amount of precipitation, the drainage area upstream, and duration of precipitation. Based on the *Survey for Jurisdictional Waters and Wetlands at the Genesis Solar Energy Project, Eastern Riverside County, California* provided in Appendix C-1 of the AFC, there are 29 identified channels, two of which may be considered waters of the State. However, these determinations are not final. Only a few of the conveyance channels are located within the facility footprint itself; most are channels that will intersect with the linear corridor. The linear corridor and associated access road will be designed using low, flat culverts to facilitate normal flows beneath the access road.

Storm flow from a drainage shed of approximately 93,000 acres enters the north portion of the Site (see Conceptual Drainage Study), Appendix A of the AFC. This drainage shed was analyzed as three sub-sheds within the Conceptual Drainage Study. Several of the areas along the north portion of the Site are anticipated to see greater flows and flow depths because they have a larger upstream drainage shed.

The storm flows will be spread across the north edge of the Site, where the existing flow will be intercepted. These flows occur within the numerous channels, and are anticipated to have broadened into sheet flow at point where they hit the north boundary of the Site. The Site slopes at less than 0.5% and the flows from the 100 year event will be broad, shallow, and not well defined, as they hit the north edge of the Site.

As the up-gradient 100 year storm flows enter the Site, the flows will be intercepted by ditches and berms. These ditches and berms will be used to divert the 100-year storm flow around and through the Site. The flows within the ditches and behind the berms will increase in volume (width and depth) as they are captured. As the flows pass though and around the Site they will be concentrated into three major flows and discharged to the south. These anticipated flow patterns can be seen in Figure 2, Map of Post Project 100 year Flow Paths. The flows will be discharged as shallow flat sheet flow. Because the up-gradient flow from the numerous channels and sheet flow will be captured across an area approximately 19,000 feet in width, and discharged at the southern edge of the project across an area of less than 3,000 feet in width, it is expected that the flows will be more concentrated leaving the Site at the three ditch/berm outfall locations. At these locations, engineering means will be used to minimize erosion and

disperse the flows as quickly as possible back to sheet flow conditions. The areas anticipated to be impacted by this are shown in Figure 2, Map of Post-Project 100 year flow paths.

These ditches and berms will be engineered structures, and may be lined with rip rap or other engineered materials to protect the integrity of the earthen banks and bottoms. These structures will be used to dissipate the water as quickly as possible back to downstream sheet flow conditions to mitigate impact on biological habitats.

Further Deliverables

Bentley Flowmaster software was used to undertake preliminary cross sections of the diversions channels that are sized to contain the 100 year 24 hour storm flow, however the water surface elevation, or HGL, of the 100 year 24 hour storm flow was not shown within the conceptual drainage study. Additional information will be provided to depict the 100 year 24 hour storm flow within the three drainage channels. This information will show that the 100 year 24 hour storm flow (the 100 year flood) is able to be passed through and around the Site. The investigation/information will show the water surface elevations, water depth, hydraulic grade line (HGL), and flow velocity within the three drainage diversion channels. In addition, the depths and predicted location of the sheet flow upstream and downstream of the channels will be undertaken to show the transition of flow into and out of the diversion channels.

The steps to provide this additional information will include:

- Reviewing the existing cross sections undertaken as part of the conceptual hydrology design and nominate additional locations for cross sections to be mapped in Bentley Flow Master or equivalent software (i.e. upstream and downstream of the diversion channels).
- Using the existing USGS topography data in the vicinity of the proposed channels (including upstream and downstream) and the existing Site detailed survey information to create the new cross sections as needed.
- Reviewing existing surface conditions and material selections for any new cross sections (i.e. to ensure the appropriate manning's "n" is used as it must reflect any operational best management practices installed in the channel such as armoring). Channels will be designed to require minimum maintenance;
- Running each model using the 100 year, 24 hour flow rates determined in the conceptual hydrology study and the outputs analyzed for water surface elevations, water depth, hydraulic grade line, flow velocities and sediment transport.
- Evaluating the model output results (water surface, velocities, HGL etc) and altering the model input conditions as necessary to ensure the HGL of the 100 year 24 hour stormwater is within the banks of the diversion channels, velocities will not scour the channel, and the water will transition to sheet flow upon leaving the Site. The model will not be calibrated as there is no real time flood depth or flow rate data for the post developed design.
- Providing a technical report containing the input parameters and results including graphical outputs of each channel in profile view for the 3 model scenarios (three diversion channel models run with the 100 year flood flows). This will also include a plan

view of the depths of stormwater within the channel and transitioning in and out of the diversion channels. More detailed information will be included regarding the outlet structures and the transition to sheet flow to help assess biological impacts.

The implementation of diversion channels will change the natural drainage pattern as the concentrated channelized flow disperses back into the historical sheet flow pattern. Modeling will be completed, using FlOW-2D or equivalent methods, to model the flow as it is captured, transmitted through and discharged from the Site. This will indicate the changes to the stormwater extent in a 100 year storm event and provide information to support a qualitative biological assessment. Where possible, a quantitative assessment will be provided, such as determining acres of sheet flow, or counting the number of trees downstream of the project before reaching Ford Dry Lake. This work will be completed and submitted to the CEC by the end of November 2009.

The outputs from the existing work undertaken will be incorporated into the detailed design, which will be in compliance with the requirements of the Riverside County Flood Control Hydrology Manual, April 1978. Additional work that will be undertaken during detailed design includes:

- Design of the detention basins (i.e. outlet design, risers, and spillway structures);
- Details of the diversion channels including individual cross sections, top of bank grades, slopes, material selection, compaction and stabilization and structures;
- Design of the mitigation outlet structures on the drainage channels to return the channelized flow to their historical sheet flow; and
- Design of any roadway crossings over existing stormwater flow paths in the transmission line linear corridor.

Responses to Data Adequacy Questions

Water Resources- Appendix B (g) (14) (C) (v)

Information Required:

Based on the information provided, the applicant stated that "Genesis Solar LLC appears to have the right to pump percolating groundwater."

Since the BLM has the right to extract groundwater, the Applicant should provide a copy of the lease or access agreement that the Applicant would have the right to extract groundwater for the duration of the lease.

The Applicant did not supply the information required.

Response:

All types of water rights, diversions, and uses of water in California are governed by principles contained in Article 10, Section 2 of the California Constitution which requires that all uses of water be put to beneficial and reasonable use, and that waste or unreasonable use or unreasonable method of use of water be prevented.

The right to divert or extract water under an overlying right is obtained by the acquisition of real property that abuts, adjoins, or overlies a natural watercourse or a groundwater basin. The overlying rights are vested property rights which are annexed to the soil and are "part and parcel" of the overlying land. Water rights are appurtenant to the land and remain with the land unless divested by prescription or severance. Because the Property is owned by the Bureau of Land Management, a federal agency, water rights generally follow local customs or laws. Accordingly, California water law governs the water rights of the Property. According to the evaluation completed by Best Best & Krieger, Attorneys at Law, providing that the lease and right-of-way grant obtained from BLM for the Property did not place any restrictions or reservations on the water rights, Genesis Solar LLC appears to have the right to pump percolating groundwater for the reasonable and beneficial use of the Project. This information is referenced in the *Genesis Solar Energy Project Data Adequacy Supplement*, (docketed October 12, 2009) Attachment I -1.1, Best Best & Krieger, Water Rights for the Genesis Solar Energy Project.

With respect to granting a Right of Way, 43 CFR 2805.14 states, " The grant conveys to you only those rights which it expressly contains. BLM issues it subject to the valid existing rights of others, including the United States. Rights which the grant conveys to you include the right to: (a) Use the described lands to construct, operate, maintain, and terminate facilities within the right-of-way for authorized purposes under the terms and conditions of the grant;". Nextera has requested the specific authorization in its 299 Right of Way Grant Application (as modified by the Plan of Development) to use groundwater for specified purposes connected with the use of the land. BLM will decide whether or not to issue the ROW Grant at the end of its environmental review process and if granted the ROW Grant will be subject to the condition that no activities other than those described in the Plan of Development (POD) can be performed on the property. Therefore BLM has the right to convey the use of groundwater as a property right under California law and will do so in its actual ROW grant either impliedly through incorporation of the POD or as an express provision.

The U.S. Department of the Interior, Bureau of Reclamation ("Bureau") had proposed a rule intended to regulate unlawful use of lower Colorado River water. The proposed rule provided a framework for identifying unlawful use, which includes a "River Aquifer/Accounting Surface" methodology used by the Bureau to identify groundwater wells that pump water replaced with water drawn from the lower Colorado River. The proposed rule was recently withdrawn from consideration. In the future, if the rule is proposed again and adopted, such wells may require an entitlement to divert Colorado River water. The study area includes the valley adjacent to the lower Colorado River and parts of some adjacent valleys in Arizona, California, Nevada, and Utah and extends from the east end of Lake Mead south to the southerly international boundary with Mexico.

A method was developed by the United States Geologic Society (USGS), in cooperation with the Bureau, to identify groundwater wells outside the flood plain of the lower Colorado River that yield water that will be replaced by water from the river. Wells in the flood plain are assumed based on their location to yield water from the Colorado River. For basins that are tributary to the flood plain, an accounting surface was developed by the USGS to assess whether wells would yield water that would be replaced by Colorado River water. According to the Colorado River Board of California, pumping water levels are permitted to drop below the elevation of the accounting surface; however, if static water levels remain below the accounting surface following a period of no groundwater withdrawal, groundwater withdrawn from the well would be considered Colorado River water.

However, as summarized in the AFC, as indicated by the groundwater modeling completed to evaluate the results of expected groundwater pumping on the Genesis Solar LCC project Site, the static water table will not be drawn down below the Colorado River Accounting Surface. Based on this modeling, Genesis Solar LLC will not violate the Accounting Surface even if eventually developed in the future into regulations.

According to the various compacts, agreements, court decisions, decrees, contracts and regulatory guidelines collectively known as the "Law of the River," the Colorado River Accounting Surface as defined by the USGS is not included in the "Law of the River" as administered by the Bureau. As such, proposed groundwater use will be permissible and consistent with the "Law of the River."

Genesis Solar LLC is located within the Chuckwalla Valley Groundwater Basin per the State of California Department of Water Resources. Figure I – 1.2 in the *Genesis Solar Energy Project Data Adequacy Supplement* contains a comprehensive list of all adjudicated basins within California. The closest adjudicated basin within Riverside County is the Beaumont Groundwater Basin, the area of jurisdiction of which overlies a portion of the Santa Ana River Watershed and is traversed by San Mateo Creek, a tributary to the Santa Ana River. The most eastern portion of the Beaumont Groundwater Basin borders Banning, California, which is approximately 125 miles west of the Genesis Solar LLC project Site.

The adjudicated Santa Margarita Valley Groundwater Basin is also located in Riverside County, the area of jurisdiction of which underlies the western part of Santa Margarita Valley in northern coastal San Diego County. The basin is controlled by the drainage of the Temecula Creek, Murietta Creek and Santa Margarita River. The most eastern portion of the Santa Margarita Valley encompasses Temecula, California, which is approximately 145 miles west of the Genesis Solar LLC project Site. Figure I – 1.3 in the *Genesis Solar Energy Project Data Adequacy Supplement* illustrates the boundary maps of the Beaumont Groundwater Basin and the Santa Margarita Valley Groundwater Basin.

As a result, Genesis Solar LLC is not located in either of the Riverside County adjudicated groundwater basins. The watersheds of the basins are not recharged nor receive inflow from the other basins as they do not share aquifers or are adjacent to one another. The surface areas of the basins do not have analogous boundaries nor are they calculated collectively thus substantiating that Genesis Solar LLC, being located in the Chuckwalla Valley Groundwater Basin, is not within an adjudicated basin and the project is not bound or restricted by the conditions of adjudicated basin water rights by definition of the California Water Code.

West from the Genesis Solar LLC project Site is the Palo Verde Irrigation District (PVID) territory. PVID occupies approximately 189 square miles of territory in Riverside and Imperial Counties including 131,298 acres, 26, 798 acres of which are on the Palo Verde Mesa Groundwater Basin. The Palo Verde Mesa Groundwater Basin and the PVID both lie west of the Chuckwalla Valley Groundwater Basin. As identified in Figure I -1.4 of the *Genesis Solar Energy Project Data Adequacy Supplement*, Palo Verde Irrigation District Boundary Map, the Genesis Solar LLC project Site is not located within the boundaries of the Palo Verde Irrigation District (PVID). Thus, Genesis Solar LLC is not constrained under the rules of PVID as relating to groundwater extraction within the boundaries of the District.

Water Resources- Appendix B (g)(14)(D)(i)

Information Required:

The Applicant needs to provide a preliminary design of the project drainage plan. The Applicant must supply pre-and post-development 100-year floodplains for the following reasons:

1. To assess what impacts will occur from the proposed development;
2. To assist in the determination of jurisdictional waters of the State of California;
3. For the development of the Streambed Alteration Agreement (the SAA permit is typically issued at the same time the permit for the project is issued).

The design of open channels requires that it be known where flow will be collected and conveyed, and where flow will only be conveyed. There is a significant difference between the design of a collector channel and a conveyance channel. If the limits of potential inflow to the channel are not known, then all reaches where there appears to be the possibility for concentrated lateral inflows should be designed as a collector channel to minimize the possibility of erosion and headcutting.

It should be noted that the absence of FEMA mapping for an area does not indicate that significant floodplains or flood-related hazards do not exist.

In addition, the Applicant did not provide any alternatives to the proposed drainage plans for the Site. The determination of pre-and post-development 100-year floodplains with various alternatives would be required as part of the data adequacy requirement.

It should be noted that floodplain mapping for more frequent flood events may be requested as part of the biological impacts assessment and in support of a Streambed Alteration Agreement, if required.

The Applicant did not supply the information required.

Response:

The Genesis Solar Project Team and the CEC have continued to discuss this request and have agreed to provide the information contained in this Supplement 1A now, followed by detailed

modeling and analysis by the end of November, 2009. Please see the Narrative included at the beginning of this Data Adequacy Supplement 1A.

Water Resources-Appendix B (g)(14)(D)(vi)

Information Required:

The effects of the project on the 100-year flood plain, flooding potential of adjacent lands or water bodies, or other water inundation zones.

Response:

Please see the Narrative included at the beginning of this Data Adequacy Supplement 1A.

Water Resources-Appendix B (g)(14)(D)(vii)

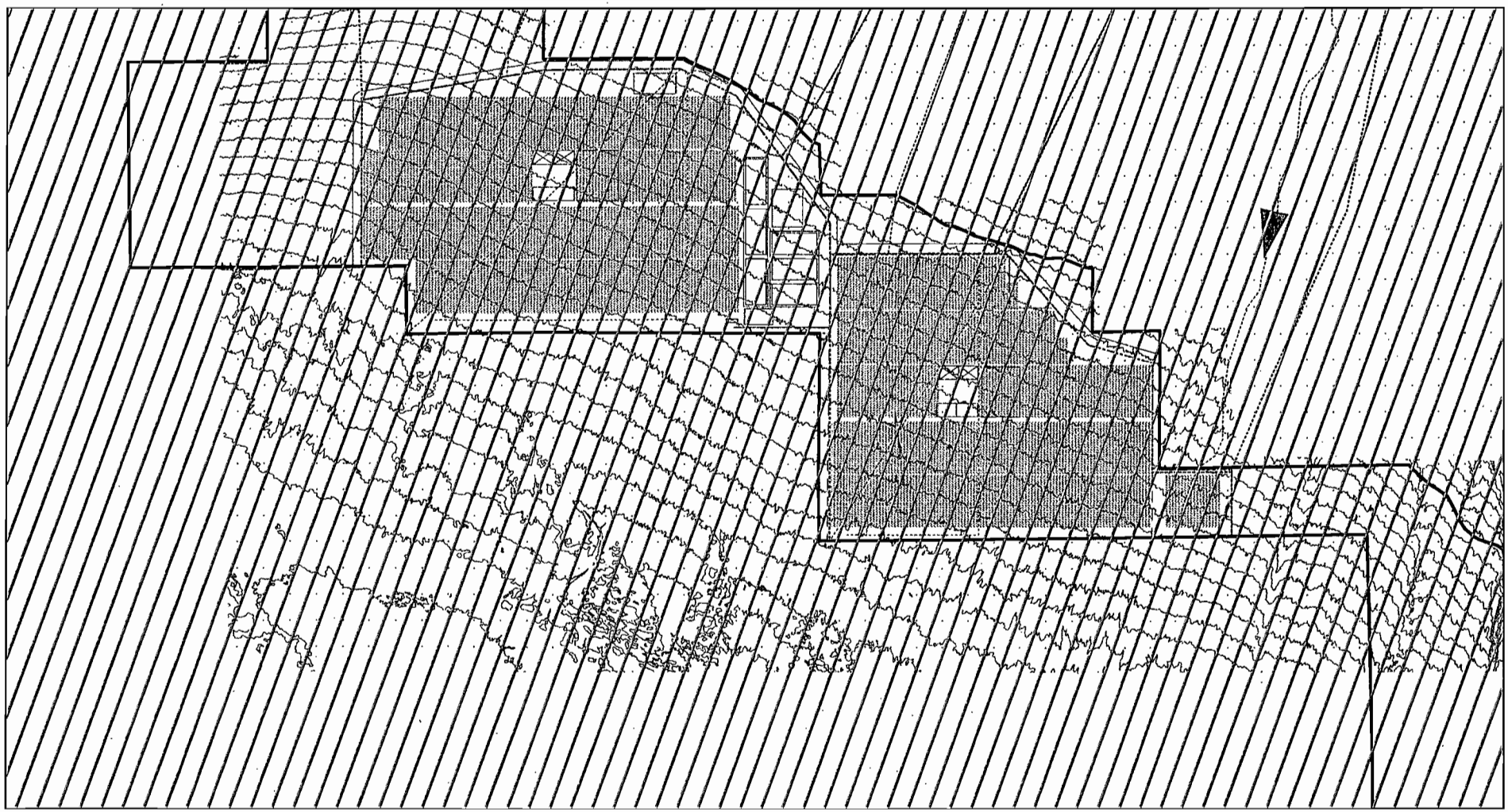
Information Required:

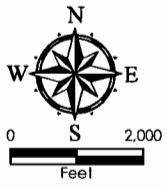
All assumptions, evidence, references, and calculations used in the analysis to assess these effects.

The Applicant did not supply the information required.

Response:

All assumptions, evidence, references, and calculations used in the analysis will be provided to the CEC with the modeling work by the end of November 2009. A key assumption in the investigation will be that an average surface elevation will be used, based on the existing LiDAR (Light Detection and Ranging) survey undertaken in 2008 for the project Site and UGSG topography for areas not covered by the LiDAR survey.





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MAP OF PRE-PROJECT
100 YEAR FLOW PATTERN

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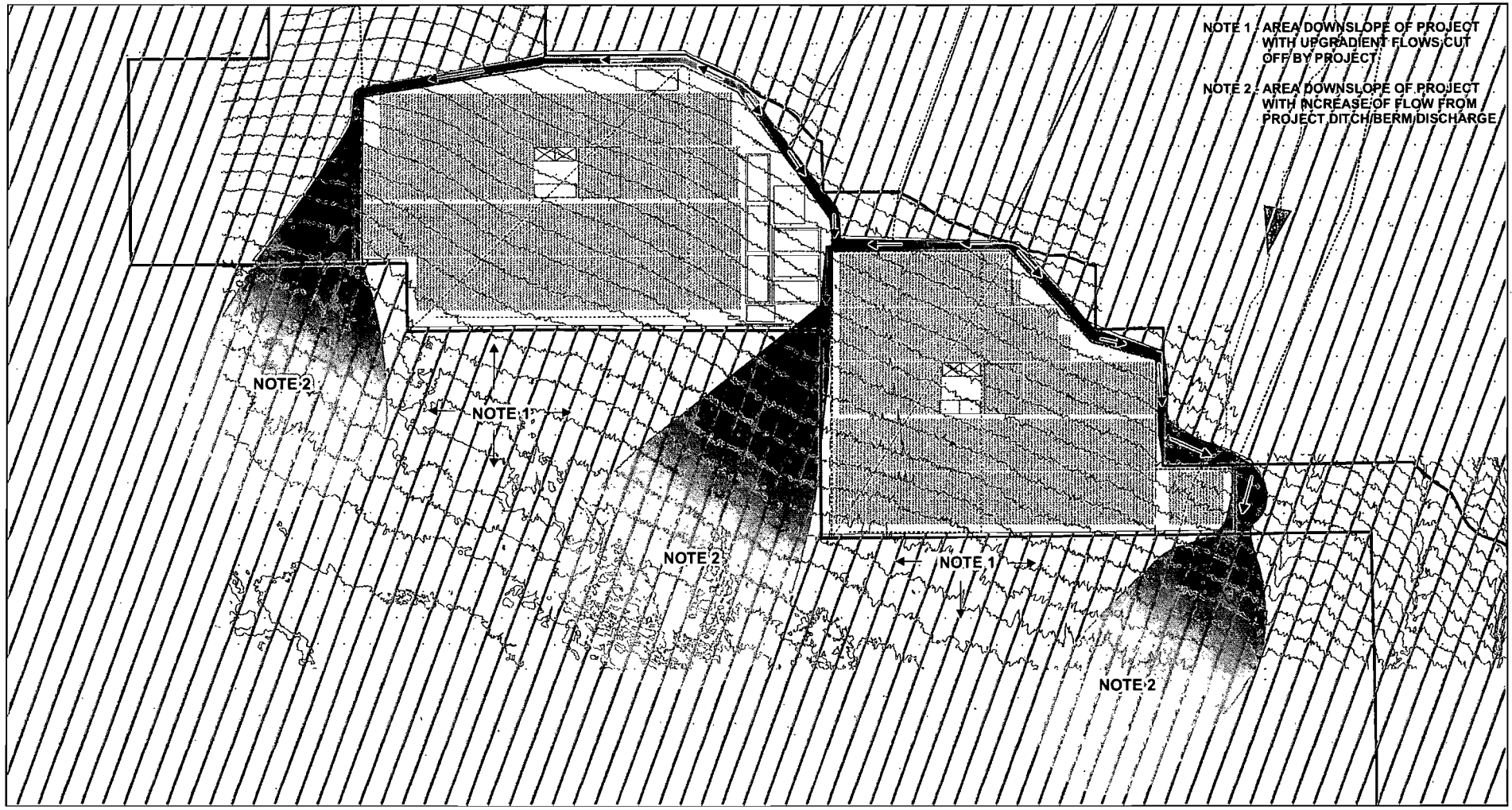

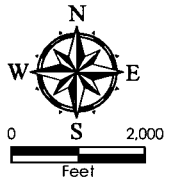

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MAP OF POST-PROJECT
100 YEAR FLOW PATTERN

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