AEA Appendix 4

Effects to Unarmored Threespine Stickleback

State of California
Department of Fish and Wildlife

M e m o r a n d u m

Date: October 19, 2016

To: Betty Courtney
Environmental Program Manager I
Department of Fish and Wildlife, Region 5

From: John Wesling, Senior Engineering Geologist
Marcin Whitman, Senior Hydraulic Engineer
Department of Fish and Wildlife, Conservation Engineering

Subject: **Engineering Review of Take Avoidance of Unarmored Threespine Stickleback Proposed Bridges and Flood-Control Facilities on the Santa Clara River Newhall Ranch Resource Management and Development Plan/Spineflower Conservation Plan Additional Environmental Analysis**

This memorandum presents the results of our review of engineering, hydrologic, and geomorphic studies related to the applicant proposed Project Design Features (PDFs) and Mitigation Measures to avoid prohibited take and possession of unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*) during construction of bridges and streambank stabilization along the Santa Clara River.

BACKGROUND

The California Department of Fish and Wildlife (CDFW), acting as lead agency under the California Environmental Quality Act (CEQA), certified the Newhall Ranch Resource Management and Development Plan/Spineflower Conservation Plan (RMDP/SCP) (Project) Final Environmental Impact Report (EIR) (2010 FEIR; SCH No. 2000011025) in December 2010.

Related litigation ensued in January 2011, and the California Supreme Court (Court) issued a decision on three issues in November 2015. One issue concerned two biological mitigation measures (BIO-44 and BIO-46) designed to protect the unarmored threespine stickleback, a federal and State endangered and State Fully Protected species. The Court determined the measures constituted "take" as defined under state law and that CDFW, in approving the project, had violated Fish and Game Code section 5515. [1]

CORRECTIVE ACTION

CDFW, at the request of the project applicant, FivePoint LLC, (formerly, Newhall Land and Farming Company) has begun a corrective action to modify project elements to comply with

[1] "Take" means hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill (Fish & G. Code, § 86).

the Court's ruling. The project applicant has proposed to implement new Project Design Features (PDFs) and Mitigation Measures to avoid contact with the wetted channel of the Santa Clara River, thereby removing the need for BIO-44 and BIO-46 and eliminating the associated potential for prohibited take and possession of unarmored threespine stickleback.

The proposed PDFs include modifications to the construction of, (1) the permanent bridges at Commerce Center Drive and Long Canyon Road; (2) the temporary haul route bridges at Long Canyon Road; and (3) the bank stabilization

Permanent bridges

Proposed modifications include: (1) reduce the number of bridge piers and include a span between the piers to accommodate the maximum wetted channel during the dry season (June 1 through September 30); (2) relocate bridge piers to span the bridge deck across the entirety of the wetted channel of the Santa Clara River; and (3) increase the span between permanent bridge piers from the 100-foot span analyzed in the 2010 FEIR to a minimum of a 165-foot span over the entirety of the wetted dry season channel.

T**emporary haul route bridges**

Proposed modifications include: (1) no contact with water or the wetted channel; (2) install and remove piles only when they are outside of the wetted channel; and (3) install a span bridge, eliminating the placement of culverts in the Santa Clara River; and (4) restrict the duration of the temporary haul route bridges to three years instead of the life of the Project.

Bank stabilization

Proposed modifications include: (1) restrict construction to the dry season (June 1 through September 30) in areas subject to inundation by seasonal flood flows (e.g., San Jose Flats/Mission Village); (2) implement in a manner that would not affect the extent of the wetted channel (e.g. reduce surface flows); (3) no water diversions; and (4) no dewatering discharge to the river.

REASONABLENESS OF CORRECTIVE ACTION

Our review focuses on engineering and geomorphic aspects of the proposed corrective action and related studies and their "reasonableness", which is informed by the below three questions:

1. Can the bridges and bank stabilization be constructed without diversion of the river and the associated collection and relocation of unarmored threespine stickleback?
2. Will the proposed construction timing and methods avoid take and possession of unarmored threespine stickleback?
3. Will the proposed construction timing and methods change any proposed mitigation measures in the EIR or require additional measures?

The "reasonableness standard" for this project tests whether the proposed corrective action (i.e., timing and construction modifications) are appropriately designed to avoid and possession take of unarmored threespine stickleback.

SCOPE OF REVIEW

The scope of our review includes:

- Site visits on 2 June 2016 (Whitman) and 13 June 2016 (Wesling),
- Review of readily available aerial imagery on Google Earth,
- Review of published geologic maps, and
- Review of technical reports and documents prepared by the project applicant, FivePoint, LLC, and their consultants. The below Project documents:
  - Geomorphological Monitoring and Management Program, Santa Clara River Baseline Report, Newhall Ranch, Santa Clara River Watershed – Daniel Tormey, Ph.D. – Ramboll Environ (October 2005a) (p. 100)
  - Workplan for Geomorphological Monitoring and Management Program, Newhall Ranch, Santa Clara River Watershed – Daniel Tormey, Ph.D. – Ramboll Environ (October 2005b) (p. 25)
  - Memorandum: Implementation of Proposed “No Water Contract” Construction Program - Santa Clara River RMDP Permanent Bridges and Temporary Haul Route Bridges – Gary Antonucci – Moffatt & Nichol (Aug. 2016) (p. 9)
  - Memorandum: Pile Installation Procedures - Commerce Center Drive and Long Canyon Road Bridges (CIDH), Temporary Haul Route Bridges (Temporary Steel HP Piles) – Gary Antonucci – Moffatt & Nichol (Aug. 3, 2016) (p. 10)
  - Tech. Memo: Santa Clara River Low-Flow Inundation Analysis – Mark Krebs and Jose Cruz – PACE (Aug. 5, 2016) (p.16)
  - Memorandum: Santa Clara River Seasonal Streamflow Analysis – Aaron Poresky and Austin Orr – Geosyntec (July 2016) (p. 26)
  - Assessment of Construction-Related Impacts on Fish in Santa Clara River, Newhall Ranch RMDP – Joel Mulder and Steve Howard – ICF (Sept. 2016) (p.47)
  - Memorandum: Impacts to fish from vibratory pile installation – Joel Mulder – Cardno (Aug. 3, 2016) (p. 88)
  - Santa Clara Low-Flow Inundation Analysis – Mark Krebs and Jose Cruz – PACE (Aug. 5, 2016) (p. 9)
  - Tech. Memo: Pier Scour Analysis – Commerce Center Drive Bridge – Mark Krebs and Jose Cruz – PACE (Aug. 25, 2016) (p. 30)
  - Tech. Memo: Pier Scour Analysis – Permanent Bridges – Mark Krebs and Jose Cruz – PACE (Aug. 25, 2016) (p. 30)
  - Memorandum: Implementation of Proposed “No Water Contact” Construction Program – Gary Antonucci – Moffatt and Nichol (Aug. 2016) (p. 9)
  - Memorandum: pH and Effects on Sensitive Fish Species – Joel Mulder – ICF International (Sept. 12, 2016) (p. 122)
  - Tech. Memo: Potential pH Impact of Curing Cement in CIDH Bridge Piers (Newhall Ranch Specific Plan) – John Porcello and Dennis Nelson – GSI Water Solutions, Inc. (Sept. 12, 2016) (p.125)

- Pier Scour Analysis – Permanent Bridges – Mark Krebs and Jose Cruz – PACE (Aug. 25, 2016)
- Pier Scour Analysis – Long Canyon Bridge – Mark Krebs and Jose Cruz – PACE (Sept. 12, 2016)
- Pier Scour Analysis – Newhall Ranch RMDP Permanent Bridges; Mark Krebs and Jose Cruz, PACE (Sept. 30, 2016) (p. 29)
- Assessment of Construction-Related Impacts on Fish in Santa Clara River, Newhall Ranch Resource Management and Development Plan – Joel Mulder and Steve Howard – ICF International and R2 Resource Consultants, respectively (Sept. 2016) (p. 41)
- Tech. Memo.: Pier Scour Analysis – Newhall Ranch RMDP Temporary Haul Route Bridge – Mark Krebs and Jose Cruz – PACE (Oct. 3, 2016)

DISCUSSION

The proposed corrective action as with the project as originally approved raises the specter of transient and long term impacts to the Santa Clara River stream course, its habitats, and inhabitants, including the unarmored threespine stickleback. In the context of this review, transient impacts are temporary and relate to construction of the bridges and streambank stabilization. Longer-term impacts are intermittent and associated with operations, maintenance, and removal, if applicable, of those facilities.

Evaluation of “No Water Contact” Construction

The corrective action proposes a “No Water Contact” approach to construction of permanent and temporary haul route bridges and streambank stabilization (Moffatt and Nichol, August 2016). The approach utilizes conventional construction techniques, and it limits most construction activities spatially to locations out of the wetted channel and temporally to the dry season (i.e., June 1 through September 30) when flow is minimal and the channel is relatively narrow and confined. The approach also includes establishing setbacks and exclusion zones from the wetted channel and provisions for implementation of Best Management Practices to control contaminants and limit construction activities to identified work zones.

The feasibility, design, and implementation of a “no water contact” construction approach, including development of effective PDFs, requires an understanding of the fluvial geomorphic processes and characteristics of the Santa Clara River, the timing and magnitude of likely flows during the construction season, and the response of the river to potential interactions with and effects of engineered structures. Understanding these factors also informs potential limitations and adverse conditions that could affect successful completion of the Project. The numerous technical studies (listed above) utilize procedures and methods that are consistent with engineering standard of practice. The results and conclusions of the studies have informed the “no water contact” construction approach as described below.

Santa Clara River

An understanding of the hydrology and geomorphology of the Santa Clara River through the project reach is necessary to anticipate and evaluate potential Project impacts related to construction, long-term operations, maintenance, and removal, if applicable, of the proposed bridges and streambank stabilization.

Project documents by Ramboll Environ (2005a, b) include a discussion of hydrological and geomorphological baseline conditions of the Santa Clara River. Those studies acknowledge dynamic nature of the Santa Clara River, which consists of a multi-thread system that is subject to highly variable flows, and that has a high potential for channel adjustments during large winter storm events. The Santa Clara River has a mobile bed dominated by sand-sized particles, although some gravel also is present.

During years with low precipitation and the dry season, Santa Clara River flows are typically confined to a relatively narrow, low-flow channel that retains its position and form. However, the streamflow can be intense and intermittent in response to large winter storms coupled with releases from dams and water reclamation plants upstream of the Project reach.

A majority of sediment transport occurs during large winter flows that are characterized as “reset events” because they mobilize large portions of the river bed and may result in substantial changes in the planform geometry and cross section of the Santa Clara River. The entire width of the Santa Clara River streambed is mobilized during reset events. PACE (Sept. 30, 2016) discusses two such reset events, the 10-year and 25-year storms, for their evaluation of scour. For context, streamflows for these events are estimated at over 10,000 cubic feet per second (cfs) for the 10-year storm and over 20,000 cfs for the 25-year storm, including dam releases.

The low-flow, wetted channel at the time of the corrective action will likely will be similar in character to the existing channel; however, its alignment could differ from current conditions if the Santa Clara River is subjected to a reset event during the winter preceding the corrective action.

<u>Bridges</u>

Permanent and temporary haul route bridges differ in their purpose and thus in their design, construction, operation, maintenance, and removal, if applicable. Permanent bridges would span the entire width of the Santa Clara River at Commerce Center Drive and Long Canyon Road and support lighter loads associated with residential and commercial traffic.

Temporary haul route bridges are for hauling heavy loads of earth materials with Material Hauling Equipment (e.g., scrapers, dump trucks, earthmovers) and would be in placed in the vicinity of Long Canyon Road during construction of the Landmark Village development.

Some construction activities associated with the permanent bridges would occur in the dry streambed, including ground preparations (e.g., vegetation clearing and putting in access ramps), installation of Cast-in-Drilled-Hole (CIDH) piles, installation of pile caps, and extending bridge columns to above the support piles to the level of the bridge deck. The remaining elements of bridge construction, such as installing decking and pavement, would occur at elevated positions above the streambed and may be spatially over the wetted channel.

The design of the “No Water Contact” approach by Moffatt & Nichols (Aug. 2016) is informed by seasonal streamflow and hydraulic studies, evaluation of summer storms, and appraisal of the amount and likely sources of water that could elevate streamflow during the dry season. Identified sources of water for streamflow include precipitation and releases from upstream dams and water reclamation plants (PACE, Aug. 5, 2016; Geosyntec, July 2016). The analyses show that infrequent, small precipitation events during June and July do not meaningfully contribute to streamflow, which is dominated by water releases from dams and water reclamation plants. The largest daily mean flow rate during June and July is approximately 200 cfs, which is similar to dam releases. In contrast, storms during August and September contribute to streamflow pulses with a maximum daily mean streamflow rate of about 100 cfs.

For potential storm-induced flows in August and September, the daily mean flow rate likely does not capture the instantaneous peak flow rate, which is needed to estimate the maximum inundation potential of the storm pulses. The nearby stream gages report on the peak flow rate in a given year and the mean daily flow rate for each day of the year. Geosyntec (July 2016) used these data sets to develop a mathematical relationship of mean daily flow rate versus peak annual flow rate as a tool to estimate instantaneous peak flow rate for lower-flow, dry season days where only mean daily rates are available (Geosyntec, July 2016).

The relationship, shown as Figure A-2 of the Geosyntec report, is a power function with an apparent high level of statistical significance. An instantaneous peak streamflow of about 500 cfs is predicted for a mean daily rate of about 100 cfs, which appears to be the maximum of mean daily rates measure during the dry season. Inspection of the scatter of individual data points on the mathematical relationship indicates some variability, with the peak annual flow rates varying between 274 cfs and 1340 cfs for a mean daily flow rate of about 100 cfs (i.e., between about 85 and 115 cfs). Simple averaging of the six data points that help anchor that part of the graph might indicate a higher instantaneous peak flow rate of about more 640 cfs. However, the estimated inundation widths likely would not be substantially different than for 500 cfs, which was used in the hydraulic analyses.

The estimated peak instantaneous flow rate of 500 cfs was used in a hydraulic model to predict maximum and average widths of inundation at each of the permanent bridges during the summer dry season (PACE, Aug. 5, 2016). The modelling software used in the analysis is Hydrologic Engineering Center – River Analysis System (HEC-RAS), which was developed by the U.S. Army Corp of Engineers. The modelling assumes a rigid boundary such that the streambed geometry is fixed and does not move or erode. However, as mentioned above, the Santa Clara River is a mobile-bed river subject to erosion and scour. The assumption of a rigid boundary is considered reasonable for low summer flows compared with much larger winter storms that may include reset events of over 10,000 cfs (PACE, Sept. 30, 2016).

The results of the modelling indicate that average inundation widths are about 93 feet at Commerce Center Drive and 85 feet at Long Canyon Road; maximum predicted inundation widths are 114 feet and 91 feet, respectively. PACE (Aug. 5, 2016) concludes that the dry season flows would not inundate the pier locations and would be conveyed between them given the proposed design (pier) spacing of 165 feet. Also, this should allow plenty of room to insulate the wetted channel from CIDH pile installation activities.

A potential concern related to construction of permanent bridges is potential stranding of unarmored threespine stickleback in scour holes. PACE (Aug. 25, 2016; Sept. 12, 2016; Sept. 30, 2016) estimated the areal extent and depth of maximum and residual scour holes (i.e., maximum and residual scour) and associated water velocities for the 10-year and 25-year storm flows, which represent larger bed-mobilizing/reset events. Their analyses utilize procedures in the Federal Highways Administration (FHWA) Hydraulic Engineering Circular

No. 18 to evaluate the three components of bridge scour. The results indicate maximum scour depths ranging from about 8 to 12 feet for the various storms and bridges with corresponding velocities of nearly 5 to more than 9 feet per sec. The largest residual scour holes are estimated to be between about 6- to 8-feet wide, 15- to 17-feet long, and 3- to 4-feet deep for the different bridges and flows. The results of these studies were used with knowledge of behavioral and swimming characteristics of unarmored threespine stickleback to conclude that there is a low likelihood of stranding in scour holes (ICF International and R2 Resource Consultants, Sept. 2016).

Temporary Haul Route Bridges
The temporary haul route bridges would be relatively short and span only the low-flow, wetted channel in the Long Canyon area. The "No Water Contact" construction approach is to install the bridges during the dry season and avoid working in the wetted channel (Moffatt and Nichol, Aug. 2016). Temporary haul route bridges would be supported on steel HP piles that would be installed and extracted with a vibratory hammer that essentially vibrates the piles into and out of the dry portion of the riverbed, and modular bridge decks will be installed with a crane. Moffatt and Nichol state that visible ground surface movements due to pile installation/extraction typically do not extend beyond a distance of one to three feet away from the pile. Additionally, no residual surface depression would remain. The temporary haul route bridges would be in place during the dry season for two to three years during construction of the Landmark Village phase of the Newhall Ranch RMDP/SCP. No dewatering is needed or proposed for temporary haul route bridge construction. To avoid potential impacts to the wetted channel, activities to install/remove HP piles would be a minimum distance of 10 feet away from the wetted channel, and the use of cranes to place the modular decks also would avoid contact with the wetted channel.

A potential geotechnical outcome of the installation of temporary haul route bridges is streambank instability triggered by construction activities and vibrations associated with installation of HP piles and possibly traffic vibrations during haul operations. The banks of the low-flow channel generally appear gently to moderately sloping and stable under low-flow conditions. The proposed minimum setback of 10 feet of the pile driving operations from the bank of the low-flow channel could allow sufficient space to protect banks of the wetted channel from construction activities (e.g., pile installation/removal) depending on actual site conditions. However, the engineering basis for the 10-foot setback is not clearly stated in the available studies and may be appropriate under certain, site-specific conditions. Figure 1 illustrates a bank setback strategy that could be employed to protect bank stability and applied to actual field conditions. The streambank protection area could be the greater of 10 feet or the distance indicated by evaluating the bank setback based on Figure 1.

The temporary haul route bridges will be in place for up to three construction seasons (two to three dry-season years), with the modular decks removed after each construction season. The HP piles will remain installed in the riverbed for up to two winters. The piles may be subjected to high stream flows during the winter, possibly resulting in scour and fish stranding concerns similar to the permanent bridges. PACE (Oct. 3, 2016) evaluated maximum and residual scour at the site of the haul bridges for the 10-year and 25-year events. The predicted size and depths of scour holes are smaller than those for the permanent bridge at Long Canyon Road. The results are consistent with the much smaller size of the temporary haul route bridge piers compared with the permanent bridge. Maximum flow velocities in the scour assessment are 8 to 9 feet per second. The results of these studies were used with knowledge of behavioral and swimming characteristics of unarmored threespine stickleback to conclude that there is a low likelihood of stranding in scour holes for haul bridges (ICF International and R2 Resource Consultants, Sept. 2016).

Streambank Stabilization
Project streambank stabilization would include installation of soil-cement, flood-control infrastructure parallel to the right and left banks of the Santa Clara River in various locations. Most areas identified for streambank stabilization are in agricultural fields that may be subjected to flood flows during large winter storms but are relatively far removed from the low-flow, wetted channel that may persist during the dry season. The construction of the streambank stabilization would include excavation below the local water table and dewatering of the excavation using vertical extraction wells. The locations where streambank stabilization would be installed are relatively far from the wetted channel, and construction equipment will be able to operate without contact with the wetted channel. A concern from this activity is that the cone of depression from operation of the dewatering wells may locally alter the groundwater table to reduce or eliminate flows in the wetted channel, possibly resulting in take of unarmored threespine stickleback. To avoid potential impacts to the streamflow, groundwater pumping activities and streamflow would be monitored where dewatering activities are within 1000 feet of the wetted channel.

Evaluation of Maintenance-Related Impacts
The RMDP Maintenance Manual (Dec. 3, 2010) describes routine maintenance practices for bridges, bank stabilization, and other project features. Routine maintenance of bridges and streambank stabilization may include repaving and deck maintenance, clearing of vegetation below bridges, clearing storm drains, and other activities. Some of these activities have the potential for intermittent impacts throughout the life of these structures, including take of unarmored threespine stickleback. A "no water contact" approach is a proposed mitigation measure and should be adopted for maintenance activities based on concepts in the construction approach. Our review of engineering studies indicates that a "no water contact" approach is feasible and reasonable for long-term maintenance activities.

CONCLUSION

The "No Water Contact" construction and maintenance approach is feasible and appears to be a reasonable construction alternative to eliminate the previous mitigation measures (i.e., BIO-44 and BIO-46) that would involve diverting the flow of the river and relocating unarmored threespine stickleback. The project proponent and applicant proposes to avoid take and any possession of unarmored threespine stickleback by timing construction activities in the late summer when Santa Clara River flows are at their lowest and by utilizing construction methods that would avoid all contact with the wetted channel where unarmored threespine stickleback may occur. The available hydrologic, engineering, and geomorphological studies appear to adequately inform the Project of expected river behavior, streamflow and inundation widths, and effects of scour that address potential impacts and design considerations that will be implemented to avoid take and possession of unarmored threespine stickleback and other fishes. The proposed construction methods (e.g., CIDH pile and vibratory HP pile installation) appear feasible for avoiding impact to the wetted channel. Monitoring for impacts during construction will help assure take avoidance for the stickleback.

The proposed timing and "No Water Contact" approach does not appear to change or invalidate other mitigation measures. However, it does require additional PDFs and Mitigation Measures that are specific to the “No Water Contact” approach. These include PDFs to control contaminants, constrain work areas, avoid the wetted channel, and monitor and adjust project activities as needed to protect resources and minimize to opportunity for take of unarmored threespine stickleback. Periodic maintenance activities can reasonably be revised to a “no water contact” approach.

Lastly, it is important to acknowledge that the geomorphologic and hydrologic behavior of the Santa Clara River renders it susceptible to abrupt changes in the planform geometry (i.e., channel shifting/migration) if subjected to large winter flow events that result in substantial bed mobilization (i.e., a reset event). Bed mobilizing events may occur in as little as a 10-year storm event. This behavior has the potential to disrupt or delay construction if the low-flow channel (i.e., summer wetted channel) adjusts its position to flow through a proposed pier location. The available studies indicate that the occurrence of a reset event likely would not invalidate the “No Water Contact” approach, because the low-flow channel should be similar in character to the existing low-flow channel, although its alignment may be different. Thus, the technical studies indicate that design considerations, such as the 165-foot spacing of permanent bridge piers, would remain valid; however, it may be necessary to move pier locations.

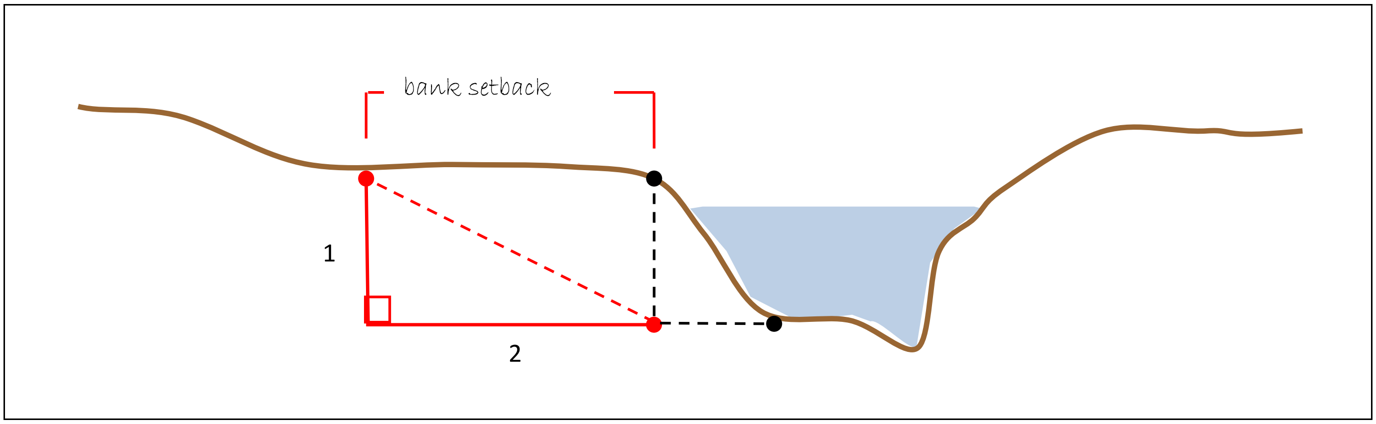

Figure 1. Bank Stability Protection Area. A setback from the bank edge to avoid or minimize impacts to the bank and stream or lake ecosystem must be determined on a site-specific, project-by-project basis. Projects proposed closer to the lake- or streamside edge of a bank than the horizontal distance twice that of the bank height (2-horizontal: 1-vertical) should include an assessment of whether on-site scientific or geotechnical analyses will be required to demonstrate that a project will not destabilize the bank, or require the introduction of hardscaping or other subsequent interventions to maintain a stable slope.

State of California
Department of Fish and Wildlife

M e m o r a n d u m

Date: 10/19/2016

To: Betty Courtney
Environmental Program Manager I
Habitat Conservation Planning - North
South Coast Region

From: Tim E. Hovey
Senior Environmental Scientist Specialist
Fisheries Program
South Coast Region

Subject: **Analysis of Impacts to Unarmored Threespine Stickleback for the Draft Additional Environmental Analysis of the Newhall Ranch RMDP/SCP**

The California Department of Fish and Wildlife (CDFW) certified the Newhall Ranch Resource Management and Development Plan/Spineflower Conservation Plan (RMDP/SCP) Final Environmental Impact Report (EIR) (2010 FEIR; SCH No. 2000011025) in December 2010. Related litigation ensued in January 2011 and the California Supreme Court issued a decision in the litigation on three issues in November 2015. One of the issues addressed by the Supreme Court concerned two biological mitigation measures (BIO-44 and BIO-46) designed to protect the unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*), a federal and State endangered and State Fully Protected species. The Court determined the measures constituted “take” as defined under state law[1] and that CDFW, in approving the project generally, had violated Fish and Game Code section 5515. CDFW at the request of the project proponent and applicant, FivePoint LLC, (formerly, The Newhall Land and Farming Company), has begun a corrective action. The applicant has proposed to implement new Project Design Features (PDFs) to avoid contact with water and the wetted channel of the Santa Clara River and render BIO-44 and BIO-46 no longer necessary.

The proposed PDFs include modifications to the construction and maintenance of, (1) the permanent bridges at Commerce Center Drive and Long Canyon Road; (2) the temporary haul route bridges at Long Canyon Road; and (3) the bank stabilization. To avoid take or possession of unarmored threespine stickleback consistent with the recent Supreme Court ruling, the applicant is proposing to implement PDFs and Mitigation Measures to ensure no construction activities occur in the wetted channel of the Santa Clara River.

In addition, the applicant is proposing to modify the two permanent bridges (Commerce Center Drive and Long Canyon Road): (1) reduce the number of bridge piers and include a span between the piers to accommodate the maximum wetted channel during the dry season (June

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1 through September 30); (2) relocate bridge piers to span the bridge deck across the entirety of the wetted channel of the Santa Clara River; (3) the span between permanent bridge piers shall increase from the 100-foot span analyzed in the 2010 FEIR to a minimum of a 165-foot span over the entirety of the wetted dry season channel.

The temporary haul route bridges include modifications such as (1) no contact with water or the wetted channel; (2) piles shall only be installed and removed when the pier locations are outside of the wetted channel; (3) a span bridge shall be installed, eliminating the placement of culverts in the Santa Clara River; and (4) the placement of the temporary haul route bridges is restricted to three years of use instead of the life of the Project.

The bank stabilization modifications include: (1) restricting construction to the dry season (June 1 through September 30) in areas subject to inundation by seasonal flood flows (e.g. San Jose Flats/Mission Village); (2) implementation in a manner that would not affect the extent of the wetted channel (e.g. reduce surface flows); (3) no water diversions; and (4) no dewatering discharge to the river.

The long-term maintenance activities modifications include: All long-term maintenance of RMDP facilities on the Santa Clara River shall adhere to timing and work zone restrictions, specifically: (1) maintenance activities shall not take place in the wetted channel of the Santa Clara River; (2) maintenance, repair or replacement of bridge structures requiring access to the riverbed shall be restricted to the period from June 1 to September 30; (3) any dewatering necessary during any maintenance activities shall not create a risk of fish stranding, either through draw down (zone of influence) or by flow discharge creating temporary habitat suitable for unarmored threespine stickleback, nor shall it involve direct removal of surface water from, or discharge to, the wetted channel of the Santa Clara River.

The proposed Commerce Center Drive and Long Canyon Road bridges will span the Santa Clara River in a reach of the Santa Clara River watershed drainage that supports several species of native fishes, including one of the only stable populations of unarmored threespine stickleback. As a State fully protected species, take and possession of the species is prohibited, and take cannot be authorized by CDFW pursuant to Fish and Game Code section 5515.

Construction methods and bridge pier placement have been modified by the applicant to avoid contact with water and the wetted channel of the Santa Clara River; these modifications to the project enables construction to occur without any need for the previously identified collection and relocation measures, and in a manner where the prospect of prohibited take or possession is unlikely. This memorandum provides a detailed affects analysis by CDFW on issues associated with bridge and bank protection construction activities, including potential affects to water quality (increase in pH) during concrete pier cement curing period, potential effects to fish during the vibratory bridge pile installation, and potential effects associated with pier scour due to rainfall events creating increased flows and velocity and long-term routine maintenance. In my professional opinion, the project as modified can be implemented consistent with Fish and Game Code section 5515.

Life History
The Santa Clara River Watershed located within Los Angeles and Ventura Counties, currently supports unarmored threespine stickleback along all wetted stretches above the “Dry Gap” in

Ventura. Unarmored threespine stickleback is a small fish, typically 3-6 centimeters (1.2 – 2.4 inches) in total length. It is a laterally compressed fish with three sharp spines in front of the soft dorsal fin. They require specific habitat conditions to support a healthy and reproductive population. Unarmored threespine stickleback prefer shallow, quiet water with weedy pools, water behind obstructions, and backwaters surrounded by emergent vegetation at stream edges over bottoms of gravel, sand and mud. The water quality [turbidity] should be sufficiently clear for aquatic vegetation to grow. Aquatic vegetation is required by unarmored threespine stickleback to build nests. Nest building and breeding begins as soon as the water warms in April and continues through July. Once the eggs are laid, the embryos hatch in 6 to 8 days at 18 - 20 degrees Celsius (64.4 – 68 degrees Fahrenheit). Most unarmored threespine sticklebacks complete their life cycle in one year. However, the presence of larger individuals in a population indicates that a few may live for two or possibly three years.

CDFW evaluation of the species life history determined instream flows, habitat, water quality and velocity are important factors to the subsistence of unarmored threespine stickleback. Bridge construction (permanent and temporary), installation of bank protection and general maintenance will be evaluated to determine what impacts, if any, on unarmored threespine stickleback will occur during the project.

Construction methods
The PDFs ensure that construction and installation of all features (bridge piers, temporary bridge piles, and bank protections) will occur outside of the wetted channel and any surface water. The revised construction and installation methods eliminate the need for water diversions. If dewatering is necessary for the bank stabilization construction, it will not alter surface flows and the dewatered water will be captured and placed onto a nearby agricultural field for percolation back into the watershed. Modifying the previous plan for construction and installation of the permanent bridges and temporary water crossings will obviate the need for the previously approved mitigation measures BIO-44 and BIO-46, and avoid significant impacts to, and take or possession of the unarmored threespine stickleback.

Maintenance of Bridges and Bank Stabilization
The PDF for maintenance requires for the same restrictions as construction activities. The modification to the maintenance activities to avoid the wetted channel, limit activities to the period from June 1 to September 30, and dewatering, if necessary, shall not create a risk of fish stranding. This modification from the previous maintenance plan will obviate the need for the previous approve mitigation measures BIO-44 and BIO-46, and avoid significant impacts to, and take or possession of unarmored threespine stickleback.

Increases in pH due to curing cement
The PDFs calls for drilling, placement of steel casings, and cement for the construction of the bridge piers. The cement endcap, at the base of the pier (approximately 20 feet below the bed), will come in contact with groundwater (0 – 15 feet [currently, in drought conditions]). The technical memorandum prepared by GSI Water Solutions, Inc. (September 2016) establishes that a rise in pH levels occurs within a thin interface along the immediate pier itself. The increased pH elevation does not extend outward a measurable distance into the aquifer and away from the pier face. During the curing process, pore water leaches from the cement piers into the adjoining groundwater. The pore water, created by a chemical reaction of mixing water with the cement mixture, increases the pH in water to 12 or higher during the first 90-hours of cement curing. However, the volume of pore water and the rate at which it is

released is low. Concluding that ambient groundwater will mix with this pore water, diluting the higher pH mixture, likely having little to no effect on the pH of the groundwater. The distance the pH mixture travels before discharging to the river's surface water is estimated to be 1 - 2 miles. The length of time required to travel this distance (several months to a few years) indicates that it is unlikely that any significant change in pH will be noticed in the surface water during pier cement curing, even considering the number of piers being constructed. CDFW also acknowledge this as a temporary, less than significant impact on water quality.

Vibration from pile driving
The Project includes two temporary haul route bridges located near the Long Canyon Road Bridge. Temporary bridge support pilings, consisting of pre-fabricated steel HP piles, would be installed using vibratory pile driving. Vibratory pile driving produces sound, measured in decibels. According to Mulder (2016), vibratory pile driving produces a continuous sound with average, near-source peak sound ranging from 165-185 decibels.

It is well documented that sound exposure can adversely impact wildlife, including fish. Impacts to fish include, but are not limited to, tissue damage, temporary hearing loss, and lowered fitness (Mulder 2016). There is little existing literature assessing vibratory pile driving sound impacts on fish. However, a small number of studies suggest that impacts are unlikely to injure fish or alter their behavior (Mulder 2016).

The California Department of Transportation (Caltrans) (2015) identified sound levels that could result in injury to fish from impact pile driving. Impact pile driving, which differs from vibratory pile driving, peak sounds of 206 decibels may injure all sizes of fish. Cumulative sounds of 187 decibels may injure fish larger than 0.0705 ounces (2 grams), and 183 decibels may impact fish smaller than 0.0705 ounces. Any unarmored threespine stickleback weighing less than 0.0705 ounces could be adversely impacted by impact pile driving sounds of 183 decibels or higher. The document further state, "There is no established injury criteria for vibration pile driving, and resource agencies in general are not concerned that vibratory pile driving will result in adverse effects on fish (Caltrans 2016, p. 2 - 26). It should also be noted, the Caltrans document describes these operations being used in water and not on dry land, as will be the case during the Newhall bridge support installation.

The Commerce Center Drive and Long Canyon Road Bridge piers are constructed in the Cast in Drill Hole method; this type of construction technique 'does not involve any installation methods that would cause the type or magnitude of noise or vibration disturbance.' Since these piers are being installed in the dry riverbed, outside the wetted channel, the acoustic or vibration impact is not a significant impact to unarmored threespine stickleback.

Scour and Velocity Issues
The bridge piers and temporary bridge pile will create a scour effects once in place. CDFW engineers and fisheries biological staff evaluated the effects of the bridge columns and piles during high flow events and the potential impacts to unarmored threespine stickleback during and after the high flow events. It has been documented that during heavy flows, low-velocity scouring zones will develop downstream of the wetted support piers and piles. Unarmored threespine stickleback have adapted to high velocity flow by seeking out these areas of refuge. The low-velocity scour zone on the downstream side of the pier or pile can function similar to the margins of the stream, which is the primary area of refugia. As the velocities diminish and the water level subsides, conditions return to normal and unarmored threespine stickleback

return to slow moving, vegetated waters. The scour associated with the bridge piers would be consistent with the types of depressions that form naturally as a result of flood debris, trees, and vegetation in the river and does not pose a new risk of stranding for UTS in the Santa Clara River. It is unlikely that scour associated with the bridge piers would result in take of UTS.

Conclusion

In my opinion on behalf of CDFW the adjustments made by the applicant obviate the need for the previously identified collection and relocation measures. Similarly in my professional opinion the project as modified will not significantly impact unarmored threespine stickleback in the Santa Clara River during bridge construction, installation of bank protection, and long-term maintenance. Based on the detailed analysis outlined above, it is my professional opinion on behalf of CDFW that prohibited take and possession of unarmored threespine stickleback is unlikely during construction of the project and with subsequent maintenance and other activities near the Santa Clara River after buildout.