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SCIENTIFIC & REGULATORY SERVICES, INC.

MEMORANDUM

To: Barry Baba

From: Adrian Juncosa

Date: July 5, 2020

Subject: Shifler Project Site Aquatic Resources Delineation

This memorandum explains the most substantive differences between my Teichert Shifler Project Determination of Waters of the U.S. (dated December 5, 2019, and subsequently verified in writing after detailed review by the U.S. Army Corps of Engineers Sacramento District Regulatory Branch) and a report prepared by ECORP Consulting, Inc., entitled Wetland Delineation for Shifler Property, Yolo County, California (dated 1 October 2010). I provide regulatory and technical context, then focus upon differences in determination of the acreage of the features that were identified and delineated in both reports, and finally on determinations of the existence or non-existence of three-parameter wetlands and other waters of the U.S. In order to preclude any need for subsequent back-and-forth communications and responses, I provide as much detail as can reasonably be provided on paper, referencing text and photographs in the respective reports as appropriate.

These comments are based upon over 30 years of performing wetland delineations within the Sacramento and San Joaquin Valleys and elsewhere, supported by two courses in delineation science and practice from Wetland Training Institute and extensive experience providing regulatory compliance and expert witness services. In addition, I have studied the soils of the Shifler project site extensively for evaluation of the feasibility of reclamation to agricultural use. This included detailed study of soil characteristics and profiles in 19 pits excavated to depths ranging from five to 14 feet.

Regulatory Context

The primary source for the identification of waters of the U.S. is the original implementing regulations for the Clean Water Act, specifically 33 CFR Part 328, Definition of Waters of the United States, and, in subsection 328.3(a), a list of indicators that may be used to identify the ordinary high water mark (OHWM), which is the limit of federal jurisdiction over waters of the U.S. in most non-wetland waters. (Other subsections address situations like jurisdictional limit of tidal waters.) The following year, the Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory, 1987) was published, establishing the three-parameter methodology for identification of wetlands, which are one of the types of waters of the U.S. listed and qualitatively defined in 33 CFR 328. The Manual also presented some guidance on determination of "normal circumstances" (term introduced in 33 CFR 328) and how to make wetland/non-wetland determinations where or when normal circumstances do not occur.

For the purposes of the Shifler project environmental review, both 33 CFR 328 and the 1987 Manual remain generally unchanged by regulatory rule-making; however, new documentation has provided clarity and regional specificity to the process of delineation. This specifically includes the

series of Regional Supplements and revisions thereto (for the present case, the one for the Arid West Region: ERDC, 2008), and two documents providing conceptual education and specific methods for determining the OHWM in the arid southwestern U.S. (Lichvar and McColley, 2008; Curtis and Lichvar, 2010). Other than the inclusion of channel cross-section data sheets, these latter reports do not affect the determinations in either my report or ECORP's. In cases of inconsistency, if any, between the 1987 Manual and the applicable Regional Supplement, the latter takes precedence.

Originally, the wetland indicator status of plant species was provided by the National List of Plants That Occur in Wetlands (Reed, 1988). A revision was prepared in 1995-1996, but was never formally adopted by federal rule-making. The 1988 list was formally superseded by the updated lists in 2014-2018 (subject to biennial revision, but in reality change very little). For the purposes of the Shifler delineation, there are some differences between Reed (1988), which was still in effect at the time of the ECORP delineation, and the list that I relied upon (Lichvar et al., 2016), and there are some updated plant identifications, one of which was brought to my attention by you. The *Rumex* species found at my data points DP-1 through DP-4 is *R. dentatus*, facultative-wetland, rather than *R. crispus*, merely facultative, which I and ECORP previously thought it was). The most notable change in indicator status is *Cynodon dactylon* (Bermuda grass), which has correctly been changed from facultative (defined as hydrophytic) to facultative-upland (non-hydrophytic). However, none of these details (nor the 2018 revision of the plant list, which came out after my field work was complete) affect the actual vegetation determinations at any of my or ECORP's wetland determination data points.

Presciently recognizing the likelihood of legal review, the 1987 Manual specifically states that "Determination that a water body or wetland is subject to interstate commerce and therefore is a 'water of the United States' shall be made independently of procedures described in this manual." In other words, the Manual and Regional Supplements explain how to identify and determine the boundaries of a wetland, but leave jurisdictional determination to other rule-making. This separate subject of jurisdiction has undergone changes over the years, mostly pursuant to Supreme Court decisions. However, I emphasize that, although I mention jurisdictional status in places, the differences between my report and ECORP's are primarily in determination and delineation, not with respect to jurisdictional status.

ECORP cites only the original interim draft Arid West Regional Supplement (dated 2006), though the final Arid West supplement was published about two years prior to their report date. The differences between the two are minor and would not alter any aspect of the delineation of the Shifler site. In other words, details that I identify below as deviations from the Regional Supplement are equally valid for the 2006 Interim supplement as for the 2008 Final version. Likewise, the field guide to OHWM was published in 2008, but there is nothing in it that would alter the determination of the irrigation ditch OHWMs for the Shifler site.

Finally, there has been a series of Minimum Standards provided by the Sacramento District for preparation of aquatic resources delineations and graphics. The most recent of these postdates the ECORP report, but nothing in it would significantly change the methods or conclusions presented in the two delineation reports for the Shifler site, compared with the direction provided in previous Minimum Standards. Some changes, such as the acceptance of boundary survey by means of so-called "survey grade" GNSS ("GPS") field computers, with sub-meter accuracy when data are post-processed, occurred before 2010. Others, such as the requirement for geographic coordinates of site boundary corners to be shown on the delineation map, occurred after 2010, but do not substantively alter the determination of wetland or non-wetland status.

In summary, the regulatory context and agency direction for delineation of the Shifler site was not sufficiently different in 2010 to account for the differences between ECORP's and my report.

Soils

Before addressing specific features that were determined differently by ECORP and I, it is important to provide some soils background for scientific context. Other than soil map unit names, no substantive soil information is provided by ECORP. A brief summary of key characteristics, specifically capacity to infiltrate water, is provided in my report.

As noted above, I am intimately familiar with the field characteristics and Natural Resources Conservation Service (NRCS) information for the predominant soil type at the site, Yolo silt loam. Despite being a fine textured soil, varying from clay loam to silt loam, Yolo series is a soil with a relatively high water infiltration rate, with the most limiting layer having a moderately high to high capacity to infiltrate water (K_{sat} of 0.57 to 1.98 inches/hour). That's a really high rate; convert it to a full 24-hour day and you get 13.68 to 47.52 inches per day! This means that even in an enclosed depression with no outflow, many feet of standing water will infiltrate below the root zone within days before it has a chance to create the anaerobic (or more accurately micro-aerobic) conditions that are the hallmark of functional wetlands.

I can confirm from extensive empirical observation that the NRCS description of Yolo loam as a highly permeable soil is correct. In all of my soils pits, studied at various times of the year including during the rainy season, I never observed a soil layer that was perching water; nor any evidence of redoximorphic processes (soil chemistry that is indicative of anaerobiosis); nor any hydric soils. As detailed below in my discussion of the irrigation tailwater infiltration basin (and in my report and photographs), standing water infiltrates through Yolo loam so quickly that even while surface water is still present, there is no water table or saturation present at a depth of up to 20 inches at a soils test pit only a few feet away. This is a clear demonstration of artificial hydrology created by active, ongoing or very recent irrigation and, as explained below, should not be regarded as wetland hydrology.

I expect that had ECORP examined the soil data instead of merely including a map of soil map units, they might well have evaluated their field observations more critically in light of the direction of the 1987 Manual, which, in this respect, is unchanged with the advent of the Regional Supplements.

Acreage of Irrigation Ditches (Canals)

The first step in elucidating the reasons for discrepancies between reports on the same site is always to examine the methodology used. ECORP (2010) states that "The potential waters of the U.S. boundaries depicted in this report represent a calculated estimation of the jurisdictional area within the site,..." (Introduction, page 1) and later "The boundaries of potential waters of the U.S. were delineated through aerial photograph interpretation and standard field methodologies (i.e., paired data set analyses)..." (Methods, page 4). Later (page 5), the Methods state that "The total area of wetlands and other waters within the site was recorded in the field using a post-processing capable global positioning system (GPS) unit with sub-meter accuracy (Trimble GeoXT)." [GPS is now more correctly referred to as global navigation satellite system, GNSS, which uses satellites in addition to those formally within the GPS constellation.]

Notwithstanding these two conflicting statements, it is more likely that the actual method used to determine the acreage of the irrigation ditches was to determine, probably on the basis of field measurement, a nominal width, and to multiply that nominal width by the length of the ditch segments as measured by digital methods applied to the satellite photograph. This is a method that is still widely used; I use it myself, especially where GNSS accuracy is so impaired by tree cover that it is more accurate to either measure a width at a typical spot, or at a series of locations along a channel, and to determine an average width, then multiply by the channel length.

This possibility is supported by the fact that feature IC-1 is stated (on the ECORP map) to have an area of 8,025 square feet, with a length of 1,149 lineal feet. This calculates to an average width of 6.9843 feet. Feature IC-3 has an area of 48,120 square feet and a length of 3,207 feet, which calculates to an average width of 15.0047 feet. Those numbers seem to me to be implausibly close to 7 and 15 feet to just be a coincidence. I'm pretty sure they determined a nominal width in the field, and a feature length on the computer, and multiplied.

The ECORP map shows a file name ending in .dwg, which is an AutoCAD file, whereas my field data was processed with ArcGIS. There are often minor quantitative differences between these two software platforms, even if they are nominally using the same coordinate reference system and datum. This is most noticeable in acreage or length determinations of elongated features; this is exactly the case for the Shifler site as is described below.

Despite my speculation above about methodology, I cannot be sure what ECORP did. I can only affirm that my methodology for determining the acreage of the irrigation ditches was to follow the Corps Minimum Standards exactly, that is, to walk the entire perimeter holding my Trimble GeoXH GNSS device as close to exactly vertically above the OHWM as I could manage. After post-processing, the Trimble Pathfinder Office software determined the accuracy of the surveyed points to be overwhelmingly within the 6-12 inch (15 to 30 cm) accuracy range. For the earthen Magnolia Canal, I determined a slightly lower overall length and a lower average width (6.229 feet) than ECORP did; noting in the OHWM data sheet that the width at OHWM varies by angle of the side slopes. For the concrete lined Moore Canal, I determined a slightly higher length than did ECORP (4,490 feet vs. total 4,442 feet), but a much greater average width (19.813 vs. 15.005 feet). I'm confident this greater average width is correct, if for no other reason that I had the benefit of the ditch flowing at nearly its maximum normal water surface elevation (see notes on my OHWM data sheet for that feature), so I had a much better visual reference point in July (middle of irrigation season) than ECORP did in September (ditches not flowing at all). In any case, I surveyed the boundary by GNSS, and it seems clear that ECORP used a nominal estimated width of 15 feet, multiplied by a length measured by unspecified means, probably by AutoCAD. Those differences in methods could easily account for the difference in acreage.

Regardless, ECORP and I both considered the irrigation ditches to be waters of the U.S. My determination of acreage benefited from better conditions for determination of the OHWM (namely, the Moore Canal conducting water at, or nearly at, the highest level that occurs at any time during the irrigation season), and are in conformance with current Minimum Standards, and utilized the current standard technology (GNSS unit capable of post-correction of positions using multiple base stations). I'm confident it's correct, is within the required range of accuracy for delineation, and the Corps regulatory staff concurred.

Determinations of Three-Parameter Wetlands and Other Isolated Waters

I studied all of the areas that were examined by ECORP, and additional sites which they did not, and found neither wetlands nor other waters of the U.S. anywhere on the Shifler site other than the irrigation ditches discussed above. My results indicate that ECORP incorrectly determined the features SW-1 and Marsh-1 as wetlands, and incorrectly determined the features DD-1 and Pond-1 as other waters of the U.S. Detailed explanations are provided below.

FEATURES SUPPORTED BY OFF-SITE IRRIGATION LEAKAGE

These comments pertain to ECORP features SW-1, Marsh-1, and DD-1.

I studied several data points in this area, where there are obvious facultative-wetland plants present (e.g., large willow and cottonwood shrubs/trees) along with many saturation-intolerant species such as interior live oak and upland grasses. My data point DP-5 is nearly in exactly the same spot as ECORP's point 03, yet the soils I observed were not at all the same as is noted on the ECORP data sheet. Specifically, they found strong redoximorphic features (contrast between matrix with value/chroma of 4/2 and mottles of 4/6 ["prominent"], and I found only very weak color contrast (matrix of 3/2 and mottles of 3/3 which is defined by NRCS as "faint" and is insufficient to meet the definition of hydric soils field indicator F3 or F6). I observed similar a similar discrepancy at another data point, which I selected to be as close as possible to (in fact, completely surrounded by) leaking irrigation water: the redox color contrast was faint, not distinct or prominent as the definition requires. I included photographs of these soils in my report to support the accuracy of my recorded observations. Based on my knowledge of wetland science and the soil geochemistry involved in the development of (relatively insoluble) bright-colored ferric-compound mottles, it is implausible that such a pronounced hydric soils indicator would have just disappeared in a period of only 10 years. Moreover, if they *were* present in 2010 and subsequently disappeared, this would be the strongest possible empirical evidence that the hydrology that created them was so impermanent or erratic that it should be judged not to be wetland hydrology under normal circumstances, as directed in Appendix F of the 1987 Manual. In that case, at least one of the mandatory criteria would not be met and the area must be determined to be non-wetland.

ECORP determined that there were three wetlands or other waters near the southern project boundary, in an area that is unequivocally (not "likely" or "possibly") substantially affected by leakage from off-site irrigation works for the small cemetery located on top of the hillside. Photographs proving this are provided in my report (Appendix A). What I understand from Corps staff to be the correct procedure for this type of situation is to indicate that normal circumstances do not occur, and to evaluate whether the mandatory wetland criteria would be met under normal circumstances, that is, absent the supplemental water from irrigation. In the Sacramento District, the regulatory staff have the option of either accepting the evidence presented, if it is compelling enough, or to require modification of the irrigation (in this case would mean repair of the leaking pipe and valve works) and reevaluation afterward. In the case of my delineation, the evidence that one or more wetland criteria would not be met was deemed to be convincing, so regardless of the data point observations, the features delineated by ECORP would not be considered to be wetlands.

The 1987 Manual states (page 92, italics original): *"If hydrophytic vegetation is being maintained only because of man-induced* [sic] *wetland hydrology that would no longer exist if the activity (e.g. irrigation) were to be terminated, the area should not be considered a wetland."* This emphatic direction has not been altered or removed by the Regional Supplements and should have been followed by the

ECORP delineation also. Logically, the direction that an area should not be considered a wetland if hydrophytic vegetation is being maintained by irrigation (or leakage therefrom) also extends to the wetland hydrology and even the hydric soils criteria as well, though demonstration that hydric soils are present but being maintained only by irrigation would be more technically difficult.

ECORP feature DD-1 is also located in this area, and was determined to be a non-wetland water of the U.S. as a "drainage ditch". This was an incorrect determination for multiple reasons. For one thing, the data sheet states that the feature ends blindly in the agricultural fields; that is, that it is a drainage ditch that does not drain from or to anywhere. There is no water of the U.S. listed/defined in 33 CFR 328 that is called a "drainage ditch"; in fact, other implementing regulations and long-standing regulatory practice exclude such agricultural production features (e.g., the shallow inter-row irrigation ditches universally used in surface-irrigated row crop production operations through the country - more on this topic below) from the regulatory process. If ECORP meant that this ditch was a tributary (which *is* a type of water of the U.S.), this is falsified by the explicit statement on the data sheet that it is not tributary to any other water of the U.S. Even without invoking the SWANCC court decision (which excluded isolated waters from Clean Water Act jurisdiction), the ECORP observations do not support the identification of feature DD-1 as a water of the U.S.

Moreover, the data sheet (ECORP point 12) is incomplete and inaccurate in various ways, summarized in the following two categories:

1. The sheet states that the feature is a ditch, which can only be interpreted as meaning a constructed feature, yet does not indicate that soils are significantly disturbed, and states that normal circumstances are present, and does not evaluate the relative permanence of the feature in the Remarks.

2. The soil was evaluated only to a depth of six inches, which is normally inadequate but understandable in light of the presence of what was stated to be a high water table. No soil texture is provided, but the soil color (2.5YR 3/2) is stated to be within the range provided for Yolo silt loam in the official NRCS soil series description; in other words, almost exactly the same as for the entirety of the existing fields. Yet the determination is stated, without any supporting observation; that it meets the loamy mucky (modified) mineral hydric soils indicator (F1). To my knowledge, this is not possible. In fine textured soils such as silt or clay loams, the content of completely decomposed organic substances must be very high (up to 18 percent) to satisfy the definition of indicator F1, and in my observation and knowledge of relevant literature, this never occurs without a change in the soil color (usually to a lower chroma).

I studied a similar linear feature in this same spot, which existed in 2019, represented by my data sheets for DP-3 and DP-4. The soils I observed were presumably nearly identical to those observed by ECORP, and they were not mucky at all, and did not meet any hydric soils indicator. The vegetation at DP-4 was not hydrophytic, and at DP-3 it just barely met the hydrophytic vegetation criterion, primarily due to the presence of one overhanging willow tree, which is supported by the irrigation leakage as documented clearly in Appendix A (photographs) in my report. In accordance with the direction quoted above from the 1987 Manual, this area was determined not to be a wetland.

In reality, the physical feature is a narrow infiltration basin, whose function seems clearly (to me) to be intended to prevent the perimeter road from becoming saturated by the off-site irrigation leakage, potentially risking equipment becoming stuck and wasting valuable labor time to extract it. For an active farm, it does not help much if the saturation persists only briefly, and then infiltrates, because they need to be sure of access at all times, not just most of the time.

ECORP Pond-1

The final point of difference between ECORP (2010) and my delineation is the feature that ECORP delineated as Pond-1, represented by their data point 06. Up until 2008, the location of this topographic feature was clearly dry land (upland) in historical aerial photographs that can be viewed on Google Earth. It appears as a feature surrounded by an earthen berm in a black and white photograph dated May 3, 2008.

Based on field observation, this basin appears to have been created by pushing soil from what is now the basin floor into a berm about five to six feet high. There is a culvert at the west end that allows irrigation tailwater from the adjacent fields to enter the basin, but there is no outflow culvert or spillway. This is one clear indication that it functions as an infiltration basin, because otherwise, during a high rainfall period in the winter, it would overtop and the loose soil berm would erode and fail. This has not happened, even during the 2018-2019 winter which was the highest seasonal precipitation in recorded California history. The infiltration rate is obviously so high that even a large amount of water infiltrates within hours or days. That's not a "pond".

The ECORP data sheet for this location provides no vegetation information and no soils observations. The observations noted in the Hydrology section are internally inconsistent. On the one hand, they indicate that there was surface water present with a depth of about 12 inches; but also a water table present at a depth of 12 inches. Both of these cannot possibly be correct, because surface water depth is above the soil surface, and a water table is below it. Moreover, the indicator "surface soil cracks" is also checked. This is only possible when the soil is dry.

None of their observations are consistent with any of the others. Given that ECORP studied the site in September, when irrigation of row crops isn't usually occurring, my understanding would be that there was no water in the basin at all, and that their recorded data for all three category A indicators was inferred, not observed. That would have been absolutely incorrect procedure: the Regional Supplement states that "Indicators in Group A are based on the direct observation of surface water or groundwater during a site visit." (Page 55)

Nevertheless, ECORP determined that this feature was not a wetland, but instead that it was a pond. The only statement provided in support of that decision is that there was an OHWM, indicated by the lack of vegetation on the floor of the basin. However, the language of 33 CFR 328.3(3) lists many types of waters of the U.S., every single one of which is a natural, not human-made, landscape feature (including "...***natural*** ponds" [emphasis added]). This is not to say that no landscape feature that was constructed or modified can be a water of the U.S., because the irrigation ditches on the Shifler site, which were also constructed, are waters of the U.S. because they are functionally tributary to other waters. Also, 33 CFR 328 makes it clear that constructed impoundments that impound other waters of the U.S. (e.g., an in-channel lake or pond).

But that is not the case for the infiltration basin we are discussing. An isolated, constructed pond in an upland location, without outflow to another water of the U.S., and which is maintained only by an occasional supply of pumped or diverted water, has never to my knowledge been regarded as a water of the U.S. even prior to the series of Supreme Court decisions that have affected the limits of jurisdiction under the Clean Water Act. The logic of determining that this basin is a water of the U.S. would mean that every backyard swimming pool in the country is a water of the U.S. as well.

And that would be only if it actually holds water (literally), which it does not. At the time that I studied this data point, there had been a period of row-crop irrigation in the surface-irrigated Shifler

fields nearby. Some of the shallow inter-row ditches were still moist on the surface, and tailwater had entered the basin (see Photograph 9 in Appendix A). Significantly, even though my soils test pit was only a few feet horizontally and only a few inches vertically from standing surface water, there was no saturation throughout the 19 inch depth. This is indicative of an extremely high infiltration rate. If there were any infiltration-restrictive layer, I would have encountered saturation in my soils pit at the same elevation as the standing water a few feet away. This brings us back to my early comments under Soils, namely, that Yolo loam and similar soils infiltrate water very rapidly, despite their fine texture. I don't think water remains ponded in this basin for more than one or two days, no matter how deeply it might be present initially. It doesn't function as a "pond" with invertebrates and ducks and aquatic plants; water infiltrates too quickly for any of the biology of a true pond to appear.

At the other end of the logical evaluation of the infiltration basin is the inflow source, namely, the irrigation water. If the basin were to be considered to be a water of the U.S., then every one of the inter-row ditches in the fields has to be a tributary water of the U.S. Under the logic ECORP applied to the so-called drainage ditch at the south side of the Shifler site, that determination would also apply to every inter-row ditch in every surface-irrigated row crop farm field in the country. That's definitely not correct.

Finally, the 2001 Supreme Court decision known as SWANCC (Solid Waste Agency of Northern Cook County) excluded isolated intrastate waters from Clean Water Act jurisdiction, so no matter what labeling would apply to the infiltration basin, it would be non-jurisdictional. In my opinion, this fact should have been mentioned by ECORP, for completeness of the report.

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