APPENDIX O

CIVIL ENGINEERS I SURVEYORS I PLANNERS

June 30, 2025
Job No.: M086-010

M E M O R A N D U M

TO: Dara Dungworth – City of Davis
Stan Gryczko – City of Davis

CC: Bre Moebius – Hefner Law
Jason Cole – Black Oak Design, Inc.

FROM: Andrea J. Bellanca, P.E., Principal

SUBJECT: Willowgrove
Central Valley Flood Protection Board
Letter Dated August 13, 2024 – Additional Flows to the Davis Drain.
Davis, CA

Per the letter from the Central Valley Flood Protection Board dated August 13, 2024, the "Board Staff recommend the DEIR include information on how the City of Davis will address these additional flows to the Davis Drain".

The Preliminary Stormwater Control Plan (SCP) for the Shriner's Property prepared in June 2025 outlines the requirements for the Project to mitigate peak runoff flows such that the post-development condition is mitigated to less than the pre-development flows. This mitigation of peak flow is shown in Table 4-4. (Exhibit A). Because the post-development flows are all less than the pre-development flows, there is no impact to the Davis Drain due to peak flow.

In addition to peak flow, Table 4-4 of the SCP shows the increase in total volume of stormwater runoff for the various storm events. The largest increase in total volume of runoff occurs during the 200-year, 10-day storm, with a total increase in volume of runoff of 19.2-acre feet.

To mitigate this increase in post-development runoff volume, we are proposing to provide additional volumetric storage on-site.

First, the proposed detention basins along the eastern property line have been oversized so they provide extra volumetric storage during the large storm events. The detention basins have been sized to provide 44.50-acre feet of storage during the 200-year event.

Additional volumetric storage will be provided on-site by an "Overflow" basin (Exhibit B) located to the north of the Davis Drain (Channel A). Channel A is connected to Willow Slough Bypass which in turn is connected to the Yolo Bypass. Per the FEMA FIRM panels, the 100-year WSE at Willow Slough at the confluence of Yolo Bypass is 29.5 feet (halfway between Yolo Bypass BFE of 30 and 29 ft as annotated on FIRM panels) (Exhibit C). It is assumed the Channel A will backwater flood from Willow Slough at an elevation of 29.5. The proposed overflow basin provides 21.5-acre feet of new storage below this 100-year water surface elevation of 29.5. This is greater than the 19.2-acre feet of increased volumetric flow created by the development of the property.

The Project detention basins mitigate the peak flows to less than pre-development conditions. The 'overflow' basin provides excess volumetric storage to reduce the volume of flow being discharged from the Project to less than pre-development conditions. As a result, there is no impact to the Davis Drain from the development of the Project.

Exhibit A

- *Lag time*. DMA mapping information as provided in **Appendices C and D** was used to define the longest flow path lengths and length to centroid for each DMA, and that information was used along with the associated elevation data to calculate the lag time values, which are summarized in **Table 4-3.**

Table 4-3 Summary of Lag time parameters by drainage management area

		Flowpath				Elevation				
	n	Longest		Centroid		max	min	Slope	Lag Time	
DMA	*(unitless)*	*(feet)*	*(miles)*	*(feet)*	*(miles)*	*(feet)*	*(feet)*	*(ft/mi)*	*(min)*	*(hours)*
Pre-project										
1	0.115	5,435	1.029	3,685	0.698	38	28	9.7	110.5	1.84
2	0.115	3,948	0.748	2,000	0.379	35	28	9.4	81.8	1.36
3	0.115	2,120	0.402	1,155	0.219	36	34	5.0	61.7	1.03
Post-project										
1	0.035	4,060	0.769	2,955	0.560	38	24	18.2	25.6	0.43
2	0.04	4,180	0.792	2,000	0.379	38	24	17.7	26.1	0.44
3	0.115	1,560	0.295	630	0.119	36	25	37.2	32.7	0.55

4.2 Model Results

The HEC-HMS modeling results for pre- and post-project peak flow rate and maximum water surface elevation are summarized in **Table 4-4** and show reductions in predicted peak flow for all design storms.

Table 4-4 HEC-HMS Peak Flow and Volume Summary

	Peak Discharge (*cfs*)		Runoff Volume (ac-ft)		Dual Basin	
					Max WSE	Freeboard
Design Storm	*Pre*	*Post*	*Pre*	*Post*	*(feet)*	*(feet)*
2-year, 24-hour	12.5	3.9	8.0	14.4	25.2	7.8
10-year, 24-hour	37.6	13.0	19.6	27.2	27.1	5.9
100-year, 24-hour	131.1	70.3	62.2	70.0	30.1	2.9
200-year, 24-hour	146.2	77.2	69.5	77.6	30.7	2.3
100-year, 10-day	124.6	84.6	173.7	192.4	31.1	1.9
200-year, 10-day	137.1	99.0	193.4	212.6	31.5	1.5

The "dual basin" in this case refers to the combined North and South Basins.

Exhibit B

PRELIMINARY OVERFLOW BASIN

WILLOWGROVE

CITY OF DAVIS YOLO COUNTY CALIFORNIA

SCALE: 1"= 150' DATE: JUNE 30, 2025

LEGEND:

PROJECT BOUNDARY

FLOOD PLAIN LIMIT

NOTE:

FLOOD PLAIN LIMIT IS A ZONE "A" AND THE ASSUMED ELEVATION IS AT 29.5'.

THE RESIDENTIAL AREA ASSUMED TO BE AT ROUGHLY AT AVERAGE 35'.

21.5 AC-FT OF THE 71.3 AC-FT IS BELOW ELEVATION 29.5'

0 150 300 450

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*Figure not OCR compatible

Exhibit C

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The projection used in the preparation of this map was Universal Transverse Mercator (UTM) Zone 10N. The horizontal datum was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for bench marks shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at http://www.ngs.noaa.gov.

Base map transportation information shown on this FIRM was provided in digital format from Sacramento Area Council of Governments (SACOG). These data were developed in conjunction with the tax assessor's parcel base map and published by SACOG in June 2006. The road centerlines follow the computed centers of the parcel right-of-ways.

This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed Map Index for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the FEMA Map Service Center at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov.

If you have questions about this map or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA MAP (1-877-336-2627) or visit the FEMA website at www.fema.gov.

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- ZONE A — No Base Flood Elevations determined.
- ZONE AE — Base Flood Elevations determined.
- ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR — Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

- ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

- ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL. 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- B1 — B2 — Transect line
- 87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 4276000mN — 1000-meter Universal Transverse Mercator grid values, zone NAD 1983 UTM Zone 10N
- 600000 FT — 5000-foot grid values: California State Plane coordinate system, zone II (FIPSZONE 0402), Lambert Conformal Conic projection
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
June 18, 2010

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0610G

FIRM

FLOOD INSURANCE RATE MAP

YOLO COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 610 OF 785

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
YOLO COUNTY	060423	0610	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06113C0610G

EFFECTIVE DATE
JUNE 18, 2010

Federal Emergency Management Agency

*Figure not OCR compatible