

ATTACHMENT H:
Preliminary Drainage Assessment





Technical Memorandum

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

To: City of Sacramento

From: Adam Fischlin, PE *AJF*
Mike Motroni, PE

CC: Vance Jones, Wood Rodgers
Tom Martens, EPS

Date: September 8, 2023

Subject: Meadowview 102 – Preliminary Storm Drainage Assessment

Summary & Background

Wood Rodgers has prepared a drainage assessment review of the Meadowview 102 site. The focus of this analysis is to identify drainage infrastructure constraints and opportunities and to provide a conceptual design of the proposed drainage facilities, including detention basins and potential trunk drainage facilities. In addition, we have identified areas of additional study that will need to be addressed in future phases of the Project, including offsite flow conveyance, wetlands, and the existing pond.

Background

In January of 2022, the City of Sacramento purchased 102 acres of surplus federal land in the Meadowview area of south Sacramento. With input from City staff and the community, Wood Rodgers prepared four preliminary land use scenarios for the City’s consideration with the goal of exploring site development alternatives and feasibility of site development. It was determined that Land Use Concept #2A, dated September 1, 2023 and included as Appendix A, should be used for continued analysis of site development feasibility.

Land Use Summary

Table 1: Land Use Summary

Land Use	Acres
MDR: Medium Density Residential	±13.6 ac.
HDR: High Density Residential	±5.5 ac.
Park: Regional Sports Complex	±60.5 ac.
OS: Wetlands & Storm Drainage Facility	±19.4 ac.
ROW: Roads & Greenbelts	±3.0 ac.
Total	±102.0 ac.

Land Use Concept #2A highlights a 60.5-acre Regional Park and Sports Complex as its primary use with 13.6 acres of medium-density residential, 5.5 acres of high-density residential and 15.3 acres of wetland preservation open space as secondary uses. Remaining acreage shall accommodate the projects roads, green belts and the storm drain basin facility. Preliminary sizing of the storm drain facilities is addressed later in this report.

Design Standards

City of Sacramento Development Standards

The City of Sacramento is responsible for review of drainage plans and hydrologic and hydraulic analyses for the Project. Drainage design standards for the potential development shall comply with the Department of Utilities' "Onsite Design Manual" and all applicable City drainage standard drawings and specifications.

Stormwater Quality/Low Impact Development (LID)

The Project will be required to comply with standards in the Sacramento Region Storm Water Quality Design Manual. Water quality treatment within the detention basin footprints is the preferred and typically most efficient water quality treatment control measure along with upstream measures. Alternative means of compliance include localized water quality features at a neighborhood level. Treatment control measures will be designed using either volume-based design or flow-based design. An approximation for the required size of Treatment BMPs to meet stormwater quality requirements is five percent of the drainage area (see detention basin sizing calcs later in this memo). Based on an assumed density of 9 dwelling units per acres, the proposed land use plan would accommodate approximately 176 units. Full trash capture device(s) will be required for the project.

Low Impact Development (LID) will need to be implemented for the proposed project based on the credit criteria outlined by the Storm Water Quality Design Manual. Included in Appendix B is the LID Credits spreadsheet that outlines how the Meadowview 102 project could achieve LID compliance. A combination of parks and open space will provide a large portion of the LID credits in combination with disconnected roof drains, interceptor trees, and amended soils. Total LID credits came out to 102.7 which meets the minimum requirement of 100 credits. Below is a list of assumptions used for the LID Credit spreadsheet:

- 15.3 acres (wetland preservation & storm drain facilities) were included as natural areas.
- 25 acres of landscape area/park was assumed. This value is thought to be conservative given that a portion of the 60.5-acre regional sports complex could be developed as impervious area.
- 9 units per acre was assumed for medium-density-residential areas.
- Less than 10-foot setback assumed for efficiency multiplier related to runoff across landscaping.
- 50% of roof drains to be disconnected.
- No separated sidewalks are anticipated due to housing density.
- 400 trees were assumed (200 evergreen and 200 deciduous) split between the park and the residential areas.

If amended soils are not allowed by the City of Sacramento, then it is anticipated that approximately 1.1 acres (48,000 square feet) of additional bioretention BMPs would be required to supplement the runoff management credits to meet the 100-point minimum.

Existing Conditions

Onsite Pond

In the northwest quadrant of the Project site lies a 3.3-acre seasonal, graded pond. Based on preliminary review of historical satellite imagery, this pond was graded sometime in early 2007 and accepts flow from the federal property to the north via a graded earthen channel. The purpose and functionality of the pond is unknown and there is no known outfall that connects the pond to a permanent drainage infrastructure system. Additional information regarding drainage of the federal property will be required to fully evaluate the drainage impacts on the Meadowview 102 site.

As shown in the Preliminary Land Use Concept #2A (attached in Appendix A), the pond will be filled to accommodate portions of the proposed Regional Sport's Park facility. The current drainage from the offsite channel will be captured by future storm drainage infrastructure and tied into the future storm water quality detention basin. The existing pond volume has been accounted for in the sizing of the future detention basin later in this report.

Seasonal Wetland Features

Throughout the 102-acre project site, seasonal wetland features totaling nearly 7 acres have been identified by Madrone Ecological Consulting (see exhibit included as Appendix C). It is believed that many of these wetland features were created due to the banked and elevated training track and the lack of drainage infrastructure onsite. In the proposed land use concept, 16-acres of open space has been proposed to preserve a significant portion of the existing seasonal wetland features. Remaining wetland features not preserved by the open space area will be eliminated by the development of the proposed Medium-Density Residential and Regional Sport's Park land uses.

On-site Drainage Infrastructure

Along the western site boundary, there is existing storm drain infrastructure consisting of parallel 24-inch and 36-inch mains that are not known to serve the Meadowview 102 site. It is believed that the existing infrastructure is in place to service the existing residential subdivision northwest of the Project site and the City of Sacramento Solid Waste Corporation Yard via easements on both the federal land and the City owned Meadowview 102 property. The drainage infrastructure and easement terminate and turn westward approximately 800 feet from the northern property boundary. It is believed that these facilities and easement will remain in place and undisturbed as part of the future development and will not be used to service any portion of the proposed Project.

Additionally, there is a 21-inch reinforced concrete pressure pipe that bisects the Project site west to east and turns north in the eastern third of the property to the State of California property site. This pipe outfalls to the same 48" public drain line as the two parallel mains and is assumed to serve the entirety of the State property. This storm drain infrastructure may be relocated during future development but will not be used to service any portion of the proposed Project. Note that recent post-winter aerials reveal overflows at storm drain manholes which appear to discharge into the existing pond.

SUMP 89 Pump Station

The existing offsite storm drain "Z Line" infrastructure discharges into the existing SUMP 89 Pump Station that sits adjacent to Morrison Creek southeast of Delta Shores Circle South. While the Stone Beetland project does provide a connection point and accounts for a bypass drain line servicing the Meadowview 102 project, it is unknown whether the pump station has capacity to accept additional flow as a result of the proposed project. Further analysis would need to be completed to determine if pump station upgrades are required or if additional detention basin storage will be required.

The Drainage Master Plan for the Delta Shores development provides some 10-year and 100-year flow assumptions for the Meadowview 102 property (Federal Lands parcel). However, the land use assumptions have evolved as part of the City's land purchase efforts, and site flow rates and contributions to the SUMP 89 Pump Station will need to be further evaluated within the complete drainage study efforts for the Meadowview 102 project.

Proposed Conditions

Offsite Drainage Infrastructure

At the southern Project boundary, there is a 24-inch drain that serves the existing site. This drain pipeline is referred to as the “Z Line” in the 2013 Delta Shores Drainage Master Plan and ranges from 24-inch to 30-inch in diameter. The Z Line will be replaced as part of the Stone Beetland development and is planned to serve the Meadowview 102 property. It is anticipated that the proposed drain stub from the Stone Beetland development to the Project site will be the primary connection to drain infrastructure.

Preliminary grading and drainage exhibits for Stone Beetland development show removal of Z Line storm drain infrastructure and replacement with a storm drain bypass system. The proposed bypass will intercept flows at the existing drain service at the south end of the Meadowview site, route the storm drain pipes through proposed streets within the Stone Beetland development and ultimately reconnect with the Z line system just north of Consumnes River Blvd.

The Stone Beetland project also proposes to connect to the downstream end of the 30-inch Z Line. While Stone Beetland does account for existing drainage flows from Meadowview 102, it is unclear how proposed development of both projects will affect the capacity of the existing Z Line downstream and if additional offsite infrastructure upgrades would be necessary. It is anticipated that a detention basin will be required to service the proposed site to regulate storm water discharge and that a full drainage study will be required with future entitlement efforts.

Hydromodification

The Project will tie into portions of the existing “Z Line” as outlined above and conveyed to Morrison Creek. With use of the Hydromodification Mitigation Applicability Flow Chart (provided as Appendix E), it is believed that the project will be exempt via HMP section 3.2.8, Projects Discharging Directly to Exempted Channels. In section 3.2.8 of the HMP, Morrison Creek from the Sacramento River to Franklin Boulevard is listed as having completed construction on levee improvements which have prepared the creek for potential hydromodification impact. The Meadowview 102 project would discharge into this exempt channel via the SUMP 89 Pump Station.

Flow Calculations and Narrative

In this section, we will identify existing and proposed flows that are tributary to the proposed connection to the Stone Beetland bypass drain and connection to the “Z Line”. Those flows will be compared to the assumed pipe stub capacity to determine if additional detention/retention mitigation measure are necessary for inclusion in our preliminary basin sizing.

Offsite Flow Tributary to Onsite Pond

As mentioned earlier in this technical memorandum, there are some unknowns regarding the existing onsite pond including the tributary area that is conveyed to the pond. Additional information on the Federal Lands site to the north would be needed for further analysis for preliminary drainage study efforts. That said, we can assume that the water volume from the pond must be accounted for if the pond is to be filled and the current storm water tributary to the pond will ultimately be conveyed to a proposed storm water quality facility. Based on existing topography provided by the City of Sacramento, the existing pond is 3-acres in area and approximately 10 feet deep which yields a water volume of 30 acre-feet that needs to be accounted for in the proposed basin sizing.

Proposed Onsite Flow

Preliminary Land Use Concept #2A was again used for the purpose of determining onsite flow for the 100-year storm event. Additionally, the Sacramento City/County Drainage Manual was used to determine the onsite 100-year peak flow based on the Sacramento Method in Rainfall Zone 2 for projects 80-640 acres. Based upon the proposed land uses, it was assumed that the proposed site would be 50% impervious and using the Figure 2-15 chart from the Drainage Manual (and included as Appendix D in red), we were able to approximate the 100-year peak onsite flow at 77 CFS.

Based on our current understanding of the site topography, we can approximate the offsite area that flows to the Meadowview site from the north at 26 acres. We have outlined this approximate area on the Land Use Map in Appendix A for reference. If we add that area to the onsite flow calculations, we would use the same Figure 2-15 chart from the Drainage Manual to determine the approximate 100-year peak onsite and offsite flow at 91 CFS (as shown in blue in Appendix D).

Outfall Pipe Capacity

Existing pipe slope and invert elevation information for the 24-inch Z line stub to the proposed Meadowview 102 site is unknown and therefore, for the purposes of this drain assessment memo, it will be assumed that the pipes are at minimum slope to provide the most conservative approach. Using the “Hydraflow Express Extension” for Autodesk Civil3D, the maximum flow for a 24-inch pipe running at minimum slope is 9.41 CFS. Based on this information, it is anticipated that onsite detention will be required as the proposed flows are larger than the outfall pipe capacity.

Preliminary Stormwater Quality Detention/Retention Basin Sizing

The current land use concept provides this 4.0 acres in the southeast corner of the site. Providing the storm drainage facilities on the southern end of the site makes the most sense as this is where the existing connection to drainage infrastructure occurs and is the lowest area of elevation within the Project site.

Based on the information provided in the flow calculations and narrative, there is likely a need for a larger parcel to serve the storm water needs for this proposed project. The sizing will vary upon the ultimate land use decisions made by the City of Sacramento but the need for a detention component (due to outfall pipe capacity) and for additional storage volume (due to the existing onsite pond) will increase the footprint needed for storm water facilities.

Summary

The proposed Meadowview Project as shown in Land Use Concept #2A can meet all required storm drainage requirements with some modifications. A larger area designated for the water quality basin will need to be allocated to comply with LID. Questions remain regarding the SUMP 89 Pump Station capacity and the tributary area and intended function of the on-site pond but it is believed that necessary mitigation can be accomplished. It is anticipated that a full drainage study will further define offsite flow entering the site and conveyance to SUMP 89 pump station.

Sources

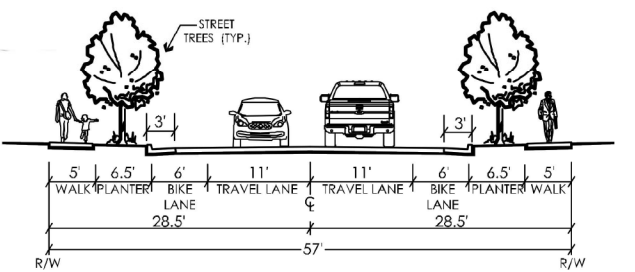
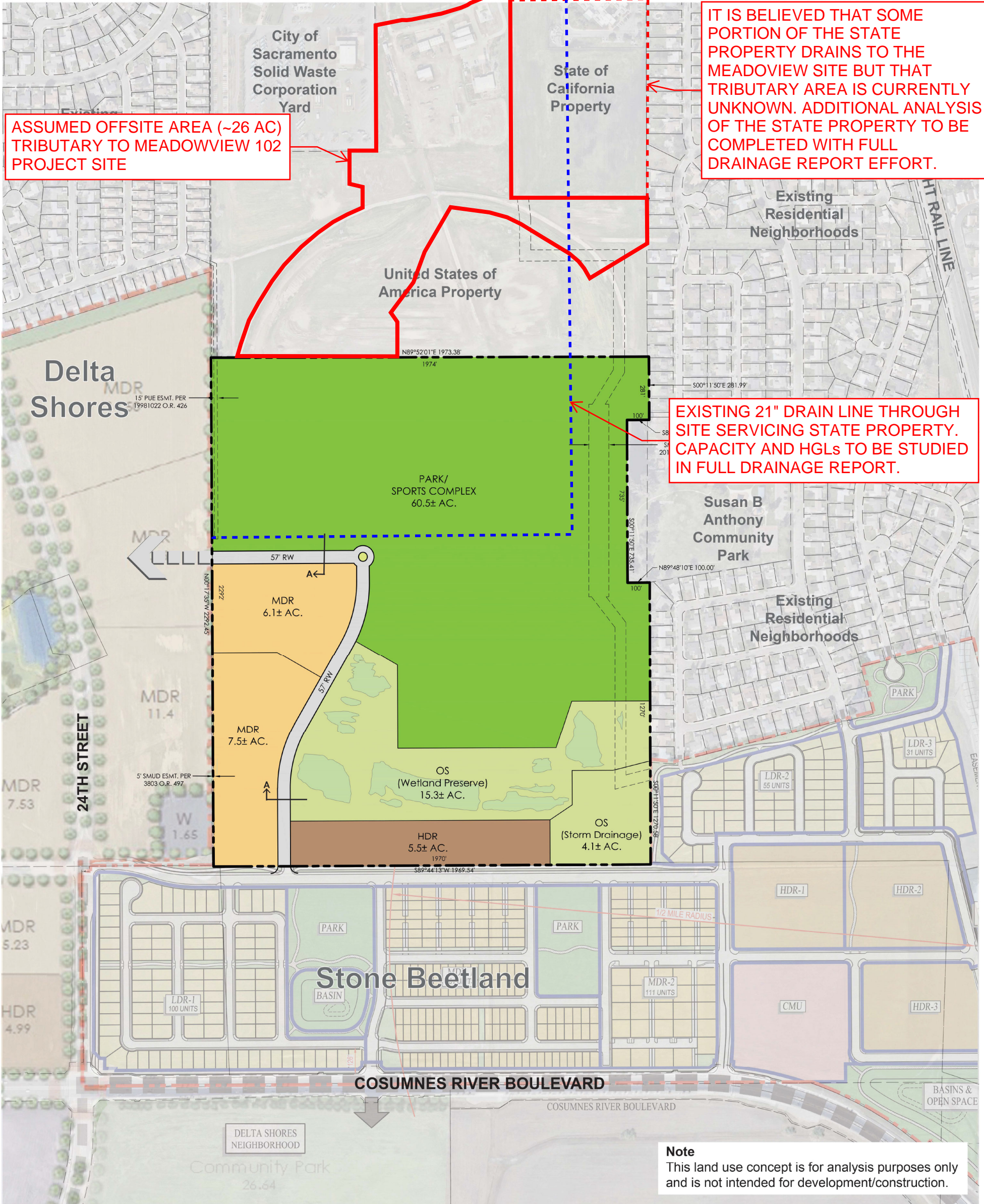
Sacramento City/County Drainage Manual

Sacramento Region Storm Water Quality Design Manual

Sacramento Stormwater Quality Partnership Hydromodification Management Plan

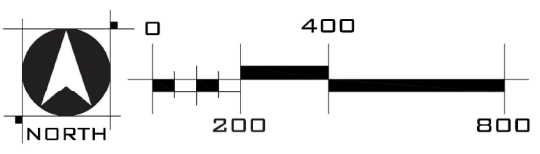
Stone Beetland Development – Preliminary Grading & Drainage Design

Appendix A – Land Use Concept #2A



MINOR COLLECTOR (NO PARKING)
57' STREET SECTION
NTS

LAND USE SUMMARY				
LAND USE		ASSUMED DENSITY	ACRES	EST. DU
MDR	MEDIUM DENSITY RESIDENTIAL	9.0 DU/AC.	13.6	122
HDR	HIGH DENSITY RESIDENTIAL	30.0 DU/AC.	5.5	165
P	PARK/SPORTS COMPLEX		60.5	
OS	OPEN SPACE		19.4	
RW	RIGHT-OF-WAY		2.9	
TOTAL			101.9 ± AC.	287 DU



MEADOWVIEW 102

Conceptual Land Use Plan - City Alternative #2A

September 1, 2023

Appendix B – Low Impact Development Credits Spreadsheet

Appendix D-1: Residential Sites: Low Impact Development (LID) Credits and Treatment BMP Sizing Calculations

Name of Drainage Shed: Meadowview 102 - Drainage Assessment

Location of project: Sacramento

Fill in Blue Highlighted boxes

Step 1 - Open Space and Pervious Area Credits

Is your project within the drainage area of a common drainage plan that includes open space? If not, skip to 1 b.

1 a. Common Drainage Plan Area

20 acres

A_{CDP}

Common Drainage Plan Open Space (Off-project)

0 acres

A_{OS}

see area example below

- a. Natural storage reservoirs and drainage corridors
- b. Buffer zones for natural water bodies
- c. Natural areas including existing trees, other vegetation, and soil
- d. Common landscape area/park
- e. Regional Flood Control/Drainage basins

0 acres
0 acres
0 acres
0 acres

1 b. Project Drainage Shed Area (Total)

102.00 acres

A

Project-Specific Open Space (In-project, communal)**

44.40 acres

A_{PSOS}

see area example below

- a. Natural storage reservoirs and drainage corridors
- b. Buffer zones for natural water bodies
- c. Natural areas including existing trees, other vegetation, and soil
- d. Landscape area/park
- e. Flood Control/Drainage basins

0.00 acres
0.00 acres
15.40 acres
25.00 acres
4.00 acres

** Doesn't include impervious areas within individual lots and surrounding individual units. That is accounted for below using Form D-1a in Step 2.

Area with Runoff Reduction Potential

$A - A_{PSOS} =$ 57.60 acres

A_T

Number of Units in A_T

176

Number of units per acre in A_T

$DU/A_T =$ 4

DUA

Assumed Initial Impervious Fraction of A_T

0.35

I

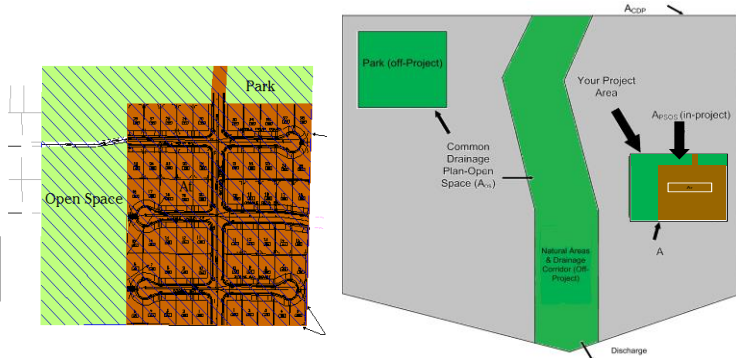
(determined using Table D-1a)

Open Space & Pervious Area LID Credit (Step 1)

$(A_{OS}/A_{CDP} + A_{PSOS}/A) \times 100 =$ 44 pts

Dwelling units per acre	Imperviousness
1	0.17
2	0.25
3,4	0.35
5,6	0.40
7	0.50
8,9	0.55
10-14	0.60
15-20	0.70

	A - Drainage Shed Area
	A_{PSOS} Parks and Open Space
	A_T - Area with Runoff Reduction Potential



Step 2 - Runoff Reduction Credits

Runoff Reduction Measures	Effective Area Managed (A_C)
Disconnected Roof Drains (see Fact Sheet)	use Form D-1a for credits → 0.82 acres
Disconnected Pavement (see Fact Sheet)	use Form D-1b for credits → 0.00 acres
Interceptor Trees (see Fact Sheet)	use Form D-1c for credits → 0.28 acres
Alternative Driveway Design (see Fact Sheet)	use Form D-1d for credits → 0.00 acres
Total Effective Area Managed (Credit Area)	A_C 1.10 acres EAM

Runoff Reduction Credit (Step 2)

$(A_C / A_T) \times 100 =$ 2 pts

Form D-1a: Disconnected Roof Drains Worksheet

See Fact Sheet for more information regarding Disconnected Roof Drain credit guidelines

Effective Area Managed (A_c)

1. Determine efficiency Multiplier

Runoff is directed to a dispersal trench or dry well (Type A and B soils only)	1.00
Runoff is directed across landscaping, determine setback	
25 ft +	Use multiplier of 1.00
≥ 20 and < 25 ft	Use multiplier of 0.90
≥ 15 and < 20 ft	Use multiplier of 0.70
≥ 10 and < 15 ft	Use multiplier of 0.45
≥ 5 and < 10 ft	Use multiplier of 0.25

Efficiency Multiplier → Box J1

2. Determine percentage of roof drains disconnected

→ Box J2

3. Select project density in dwelling units per acre:

1	Use reduction factor of	0.08
2	Use reduction factor of	0.13
3,4	Use reduction factor of	0.19
5,6	Use reduction factor of	0.23
7	Use reduction factor of	0.29
8,9	Use reduction factor of	0.33
10-14	Use reduction factor of	0.37
15-20	Use reduction factor of	0.44

Reduction Factor → Box J3

4. Determine Area Managed

Multiply Box J3 by A_T, and enter the result in Box J4 acres Box J4

5. Multiply Boxes J1, J2 and J4, and enter 60% of the Result in Box J

acres Box J

This is the amount of area credit to enter into the "Disconnected Roof Drains" Box of Form D-1

Form D-1b: Disconnected Pavement Worksheet

See Fact Sheet for more information regarding NDC Pavement credit guidelines

Effective Area Managed (A_c)

Divided Sidewalks

1. Determine percentage of units with divided Sidewalks

Box K1

Multiply Box K1, A_T, and 0.04 and enter 60% of the result in Box K

acres Box K

This is the amount of area credit to enter into the "Disconnected Pavement" Box of Form D-1

Form D-1c: Interceptor Tree Worksheet

See Fact Sheet for more information regarding Interceptor Tree credit guidelines

Effective Area Managed (A_c)

New Evergreen Trees

1. Enter number of new evergreen trees that qualify as Interceptor Trees in Box L1.

trees Box L1

2. Multiply Box L1 by 200 and enter result in Box L2

sq. ft. Box L2

New Deciduous Trees

3. Enter number of new deciduous trees that qualify as Interceptor Trees in Box L3.

trees Box L3

4. Multiply Box L3 by 100 and enter result in Box L4

sq. ft. Box L4

Existing Tree Canopy

5. Enter square footage of existing tree canopy that qualifies as Existing Tree canopy in Box L5.

sq. ft. Box L5

6. Multiply Box L5 by 0.5 and enter the result in Box L6

sq. ft. Box L6

Total Interceptor Tree Credits

Add Boxes L2, L4, and L6 and enter it into Box L7

sq. ft. Box L7

Divide Box L7 by 43,560 and multiply by 20% to get effective area managed and enter the result in Box L8

acres Box L8

This is the amount of area credit to enter into the "Interceptor Trees" Box of Form D-1

Form D-1d: Alternative Driveway Design

See Fact Sheet for more information regarding Alternative Driveway Design credit guidelines

1. Select type of driveway

Pervious Driveway:	Multiplier:
Cobblestone Block P	0.40
Pervious Concrete/A	0.60
Modular Block	
Porous Pavement	0.75
Porous Gravel	
Not Directly-connected	1.00

Box M1

2. Determine percentage of units with Alternative Driveways:

Box M2

4. Multiply Boxes M1, M2, A_T and 0.04, and enter the result in Box M

acres

This is the amount of area credit to enter into the "Alternative Driveway Design" Box of Form D-1

Step 3 - Runoff Management Credits

Capture and Use Credits

Impervious Area Managed by Rain barrels, Cisterns, and automatically-emptied systems

(see Fact Sheet) enter gallons, for simple rain barrels acres

Automated-Control Capture and Use System

(see Fact Sheet, then enter impervious area managed by the system) acres

Bioretention/Infiltration Credits

Impervious Area Managed by Bioretention BMPs

(see Fact Sheet) Bioretention Area sq ft
 Subdrain Elevation inches
 Ponding Depth, inches inches acres

Impervious Area Managed by Infiltration BMPs

(see Fact Sheet) Drawdown Time, hrs drawdown_hrs_inf
 Soil Infiltration Rate, in/hr soil_inf_rate
 Sizing Option 1: Capture Volume, acre-ft capture_vol_inf acres
 Sizing Option 2: Infiltration BMP surface area, sq ft soil_surface_area acres
 Basin or trench? approximate BMP depth ft

Impervious Area Managed by Amended Soil or Mulch Beds

(see Fact Sheet) Mulched Infiltration Area, sq ft mulch_area acres

Total Effective Area Managed by Capture-and-Use/Bioretention/Infiltration BMPs A_{LIDC}

Runoff Management Credit (Step 3) $A_{LIDC}/A_T * 200 =$ pts

Total LID Credits (Step 1+2+3) LID compliant, check for treatment sizing in Step 4

Does project require hydromodification management? If yes, proceed to using SacHM.

Adjusted Area for Flow-Based, Non-LID Treatment $A_T - A_C - A_{LIDC} =$ A_{AT}

Adjusted Impervious Fraction of A for Volume-Based, Non-LID Treatment $(A_T * I - A_C - A_{LIDC}) / A =$ I_A

Further treatment is required, see choose flow-based or volume-based sizing in Step 4

Step 4a Treatment - Flow-Based (Rational Method)

Form D-1e

Calculate treatment flow (cfs): Flow = Runoff Coefficient x Rainfall Intensity x Adjusted Treatment Area

Determine C Factor using Table D-1b C
 Determine i using Table D-1c (Rainfall Intensity) i
 A_{AT} from Step 2 A_{AT}
 Flow = C * i * A_{AT} cfs

TABLE D-1b

Development Type	Runoff Coefficient (Rational), C
Single-family areas	0.50
Multi-units, detached	0.60
Apartment dwelling areas	0.70
Multi-units, attached	0.75
User Specified	0.00

Table D-1c

Rainfall Intensity	
Roseville	i = 0.20 in/hr
Sacramento	i = 0.18 in/hr
Folsom	i = 0.20 in/hr

Step 4b Treatment - Volume-Based (ASCE-WEF)

Calculate water quality volume (Acre-Feet): WQV = Area x Maximized Detention Volume (P₀)

Obtain A from Step 1 A hrs Specified Draw Down time

Obtain P₀; Maximized Detention Volume from figures E-1 to 4 in Appendix E of this manual using I_A from Step 2. $E =$ P₀

Calculate treatment volume (acre-ft):
 Treatment volume = A x (P₀ / 12) Acre-Feet

v06232012

Appendix C – Wetland Delineation Exhibit



AQUATIC RESOURCE FEATURES

WETLANDS	
Seasonal Wetland	
Feature ID	Acreage
SW-1	0.101
SW-2	0.526
SW-3	0.023
SW-4	0.743
SW-5	0.073
SW-6	0.113
SW-7	0.048
SW-8	0.235
SW-9	0.042
SW-10	0.199
SW-11	0.047
SW-12	0.005
SW-13	0.009
SW-14	0.089
SW-15	0.022
SW-16	0.598
SW-17	0.100
SW-18	0.082
SW-19	0.458
SW-20	1.336
SW-21	0.051
SW-22	0.802
SW-23	0.010
SW-24	0.257
SW-25	0.047
SW-26	0.119
SW-27	0.203
SW-28	0.052
SW-29	0.443
SW-30	0.093
SW-31	0.008
SW-32	0.007
Total Wetlands:	6.921 acres

OTHER WATERS		
Ditch		
Feature ID	Acreage	Linear Feet
D-1	0.243	409
0.243		409
Pond		
Feature ID	Acreage	
P-1	3.311	
3.311		
Total Other Waters:	3.554	409

Aquatic Resources Total: 10.475 acres

Notes:
 Map Scale: 1 inch = 100 feet
 Coordinate System: NAD 1983 State Plane California II
 Datum: NAD83 (North American Datum 1983)
 Projection: Lambert Conformal Conic
 Vertical Data: NAVD88 (North American Vertical Datum 1988)
 Aerial Base: Maxar
 Aerial Base Flight: 12 April 2022.
 Topographic Contours: USGS NED 1/3 arc-second Contours for Sacramento W, California. 1 October 2018

Delineation Performed by: B. Peterson, D. Snider
Map Prepared by: N. Bente
Date Map Prepared: 27 March 2023
Definitions:
 NAD = North American Datum
 NAVD = North American Vertical Datum
 NED = National Elevation Database
 USGS = United State Geological Survey

Prepared For:
 City of Sacramento
 915 I Street
 Sacramento, CA 95814

- Study Area (102 acres)
- Reference Point
- Data Point
- Culvert
- Ground Surface Elevation, 5 foot contour

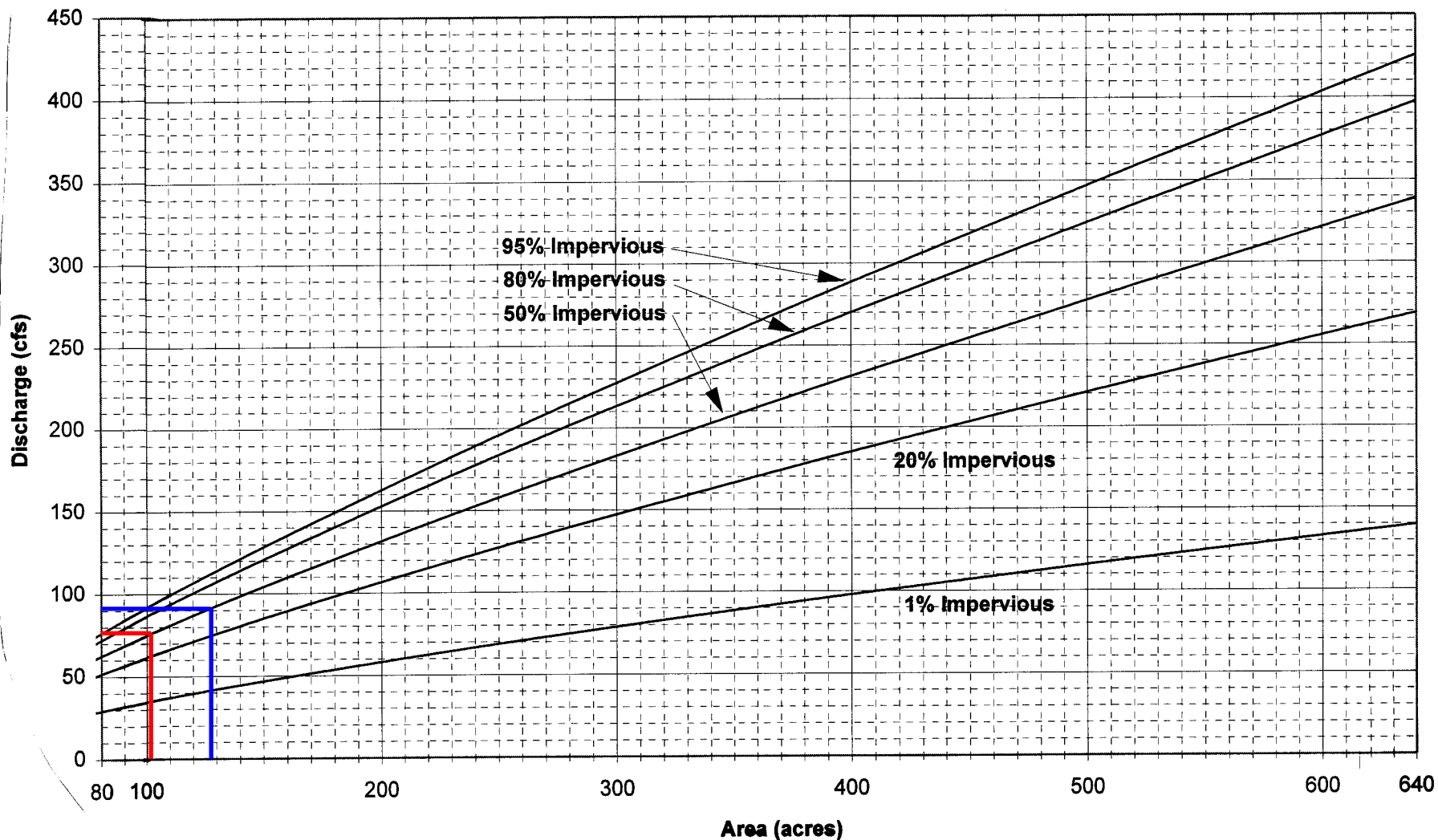
Aquatic Resources (10.475 acres)
 Wetlands (6.921 acres)
 Seasonal Wetland (6.921 acres)
 Other Waters (3.554 acres)
 Ditch (0.243 acres)
 Pond (3.311 acres)

Aquatic Resources Delineation

Meadowview 102 Acres
 Sacramento County, California

MADRONE ECOLOGICAL CONSULTING
 8412 Sunset Boulevard, Suite 208
 Citrus Heights, California 95621
 (916) 622-3220 | www.madrone.com

Appendix D – 100-Year Peak Flow Sacramento Method for Rainfall Zone 2, 80-640 Acres (Figure 2-15)



Note: Refer to accompanying disk for assumptions made in deriving this figure.

**10-Year Peak Flow
Sacramento Method
Rainfall Zone 2, 80-640 Acres**

Date **December 1996**

Figure **2-15**

Appendix E – Hydromodification Mitigation Applicability Flow Chart

Figure 5-1 Hydromodification Mitigation Applicability Flow Chart

