



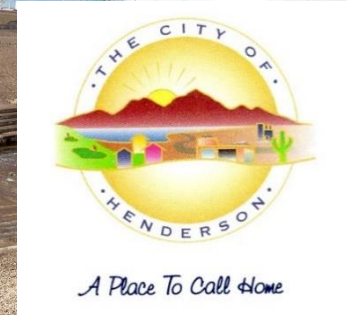
# Stormwater Quality Management Committee

## February 9, 2021



## Item 6.

- Action to accept a presentation and receive an update on the regional detention basin program ***(For possible action)***



# Las Vegas Valley MS4 Permit Detention Basin Program

February 09, 2021



# NDEP and EPA Establishment of Post-Construction Program to address New Development and Significant Redevelopment (NDSR)



"Inspirada Neighborhood." *Inspirada*, Inspirada, 25 Jan. 2018, [inspirada.com/event/inspirada-community-association-board-meeting-2/](https://inspirada.com/event/inspirada-community-association-board-meeting-2/).

# Post-Construction Program for New Development and Significant Redevelopment (NDSR)

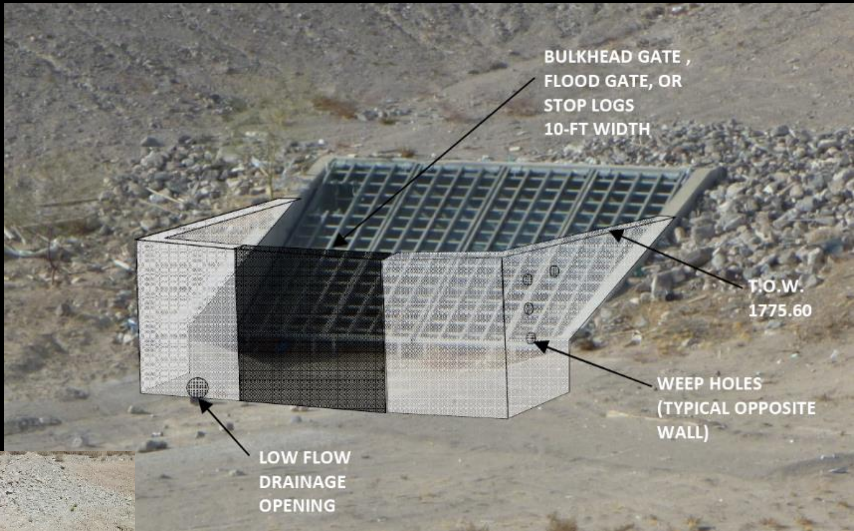
## Permit Requirements

- NDSR > 1 ac
- Review and enhance SWMP NDSR program
  - appropriate for the unique conditions
- Structural and non-structural BMPs
- Select LID measures found effective and appropriate for the Las Vegas Valley
- Assess regional flood control facilities
- Develop design standards

## Program Approach

- Source Control and Maintenance Activities
- Public Outreach and Education
- Analysis was performed to identify additional elements
  - Developed Parking Lot LID program
- Watershed-based approach
  - Stormwater treatment within regional detention basins.
- Updated CCRFCD Manual for LIDs and detention basins

# Stormwater Features Examples



# Regional Detention Basin Program

## Program Approach:

- Determine the stormwater volume required for each watershed
- Develop pollutant trading strategy across watersheds
- Develop design standards
- Develop tracking system

| Watershed                | Total MCV (AF) for All Developable Area | PCV Generated in Watershed from Proposed DBs and Planned Upgrades (AF) | Excess WQCV - Available for Trade with other Watersheds (AF) | Deficit WQCV - Needed from other Sources (AF) | Comments                                |
|--------------------------|-----------------------------------------|------------------------------------------------------------------------|--------------------------------------------------------------|-----------------------------------------------|-----------------------------------------|
| C-1 Basin                | 78                                      | 17.0                                                                   | 0                                                            | 61.0                                          |                                         |
| Central Basin            | 10                                      | 56.7                                                                   | 46.7                                                         | 0                                             | Could develop more WQCV at Meadows DB   |
| Duck Creek Basin         | 250                                     | 148.5                                                                  | 0                                                            | 101.5                                         |                                         |
| Flamingo/Tropicana Basin | 168                                     | 72.7                                                                   | 0                                                            | 95.3                                          |                                         |
| Gowan                    | 122                                     | 336.9                                                                  | 214.9                                                        | 0                                             | Could develop more WQCV                 |
| Lower Las Vegas Wash     | 44                                      | 0                                                                      | 0                                                            | 44.0                                          |                                         |
| Lower Northern Basin     | 144                                     | 194.0                                                                  | 50                                                           | 0                                             |                                         |
| Pittman Basin            | 255                                     | 276.5                                                                  | 22                                                           | 0                                             |                                         |
| Range Wash               | 146                                     | 192.4                                                                  | 46.4                                                         | 0                                             | Could develop more WQCV                 |
| Upper Northern Basin     | 222                                     | 434.9                                                                  | 212.9                                                        | 0                                             | Could develop more WQCV at Upper LWW DB |
| <b>TOTALS</b>            | <b>1,439</b>                            | <b>1,729.6</b>                                                         | 592.4                                                        | 301.8                                         |                                         |

# Design Criteria Developed to Size Stormwater Features

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

## CALCULATIONS FOR SIZING WATER QUALITY CAPTURE VOLUME (WQCV) IN REGIONAL DETENTION BASINS

Determine WQCV Using Equation I and Equation II from *Urban Runoff Quality Management* (ASCE Manual No. 87)

**Equation I:** Determine Runoff Coefficient  
 $C = 0.858i^3 - 0.78i^2 + 0.774i + 0.04$   
 C = Runoff Coefficient  
 i = watershed percent impervious

**Equation II:** Determine Maximized Detention Volume (in inches)  
 $P_0 = (a \cdot C) \cdot P_6$   
 $P_0$  = maximized detention volume in watershed inches  
 a = constant, for event maximization, drain time 24 hours (1.299)  
 $P_6$  = event average rainfall depth, for Las Vegas (0.37 inches)

**Maximized Detention Volume Table**

| Impervious Ratio | C    | $P_0$ |
|------------------|------|-------|
| 0.00             | 0.00 | 0.00  |
| 0.10             | 0.11 | 0.05  |
| 0.20             | 0.17 | 0.08  |
| 0.30             | 0.23 | 0.11  |
| 0.40             | 0.28 | 0.13  |
| 0.50             | 0.34 | 0.16  |
| 0.60             | 0.41 | 0.20  |
| 0.70             | 0.49 | 0.24  |
| 0.80             | 0.60 | 0.29  |
| 0.90             | 0.73 | 0.35  |
| 0.95             | 0.81 | 0.39  |
| 1.00             | 0.89 | 0.43  |

**Tributary Area Adjustment Factor Table**

| Area Range (sq. mi.) | Adjustment Factor |
|----------------------|-------------------|
| 0 - <1               | 1.00              |
| 1 - <10              | 0.85              |
| 10 - <40             | 0.75              |
| 40 +                 | 0.65              |

|  | Revision | Date |
|--|----------|------|
|  |          |      |
|  |          |      |
|  |          |      |

REFERENCE: MWH

FIGURE 1207A

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

## CALCULATIONS FOR SIZING WATER QUALITY CAPTURE VOLUME (WQCV) IN REGIONAL DETENTION BASINS

METHOD TO CALCULATE WATER QUALITY CAPTURE VOLUME

**Step I. Determine the following:**  
 a) WQCV for Watershed Developable Land  
 b) WQCV for Tributary Area (area upstream of facility)  
 Determine if the greater of the two values is feasible. If not, determine if the lesser value is feasible. If "no" to both, move to Step II.

**Step II. Determine the following:**  
 a) WQCV for Tributary Area Developable Land (vacant area upstream of facility)  
 Use the maximum volume feasible in the range of values determined in Step I and Step II.

**CALCULATIONS**

Watershed:   
 Facility:   
 Facility Size:

**Step I**

**Watershed Developable Land WQCV**  
 Watershed Area  sq. miles  
 Planned % Impervious

**Detention Basin Tributary Area WQCV**  
 Tributary Area  sq. miles  
 Planned % Impervious

**Maximized Detention Volume (inches)**  
 $P_0 =$   inches  
 Maximized WQCV =  acre-feet

**Maximized Detention Volume (inches)**  
 $P_0 =$   inches  
 Maximized WQCV =  acre-feet

**Adjusted Detention Volume**  
 Adjustment Factor   
 $WQCV_{WatershedA} =$   acre-feet

**Adjusted Detention Volume**  
 Adjustment Factor   
 $WQCV_{TribA} =$   acre-feet

**Step II**

**Tributary Area Developable Land WQCV**  
 Developable Vacant<sup>a</sup> Land Area  sq. miles  
 Planned % Impervious

**Maximized Detention Volume**  
 $P_0 =$   inches  
 Maximized WQCV =  acre-feet

**Adjusted Detention Volume**  
 Adjustment Factor   
 $WQCV_{vacantA} =$   acre-feet

<sup>a</sup> Developable vacant land excludes area outside the Ultimate Development Boundary

|  | Revision | Date |
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REFERENCE: MWH

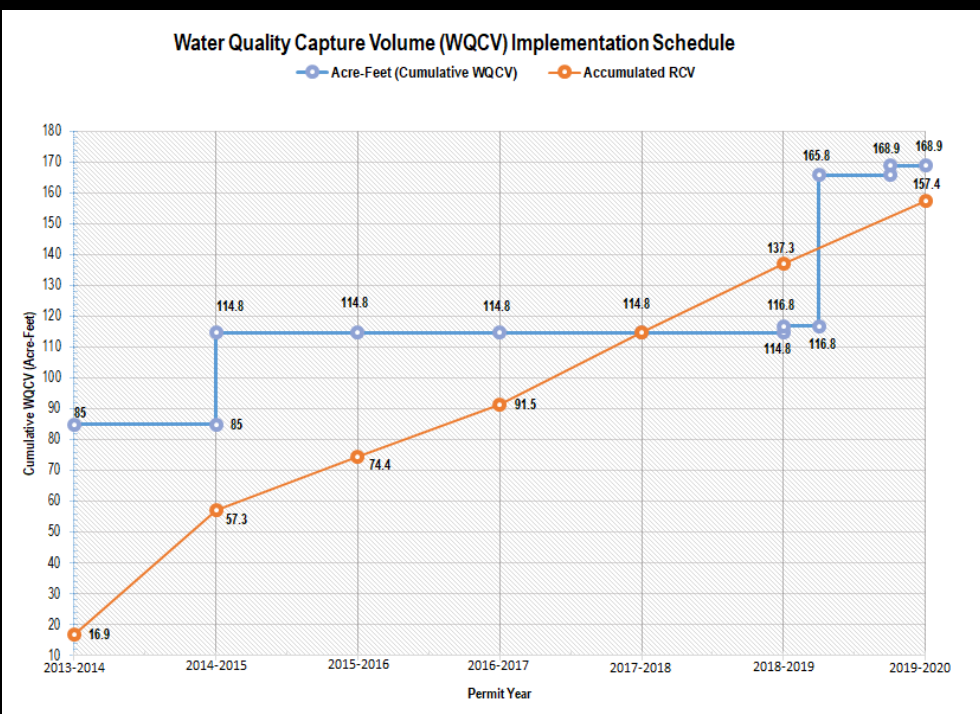
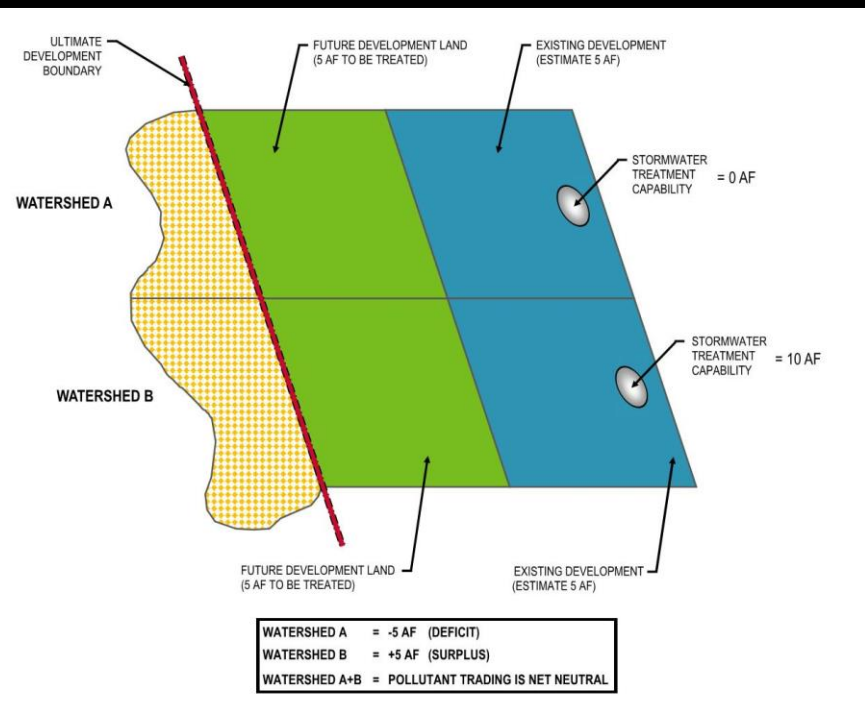
FIGURE 1207B



# Detention Basin Program Methodology

## Volume of Stormwater to be Treated

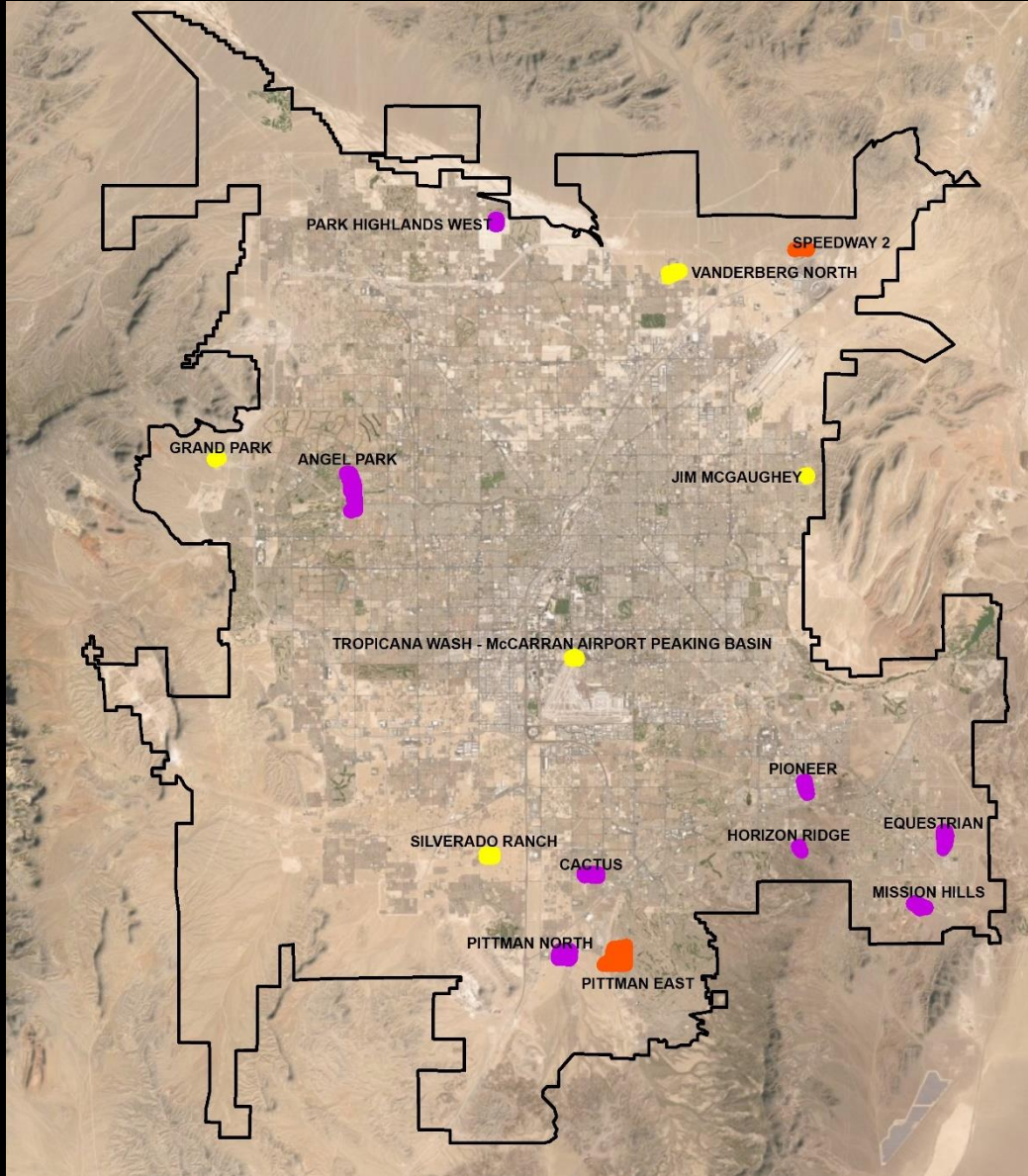
## Tracking System



# Detention Basin Program – Current Program Status

| Watershed                 | Estimated Total RCV (AF) | Potential WQCV from Proposed DBs/Planned Upgrades (AF) | WQCV Constructed (AF) | WQCV Constructed and Under Construction (AF) |
|---------------------------|--------------------------|--------------------------------------------------------|-----------------------|----------------------------------------------|
| Upper Northern Wash       | 222                      | 131                                                    | 0                     | 0                                            |
| Lower Northern Wash       | 144                      | 195                                                    | 3.1                   | 3.1                                          |
| Range Wash                | 146                      | 359                                                    | 0                     | 47                                           |
| Gowan Basin               | 122                      | 211                                                    | 85                    | 94                                           |
| Central Basin             | 10                       | 78                                                     | 0                     | 0                                            |
| Flamingo/Tropicana Washes | 168                      | 79                                                     | 0                     | 0                                            |
| Lower Las Vegas Wash      | 44                       | 0                                                      | 0                     | 0                                            |
| Duck Creek Wash           | 250                      | 353                                                    | 0                     | 20                                           |
| Pittman Wash              | 255                      | 113                                                    | 63                    | 63                                           |
| C-1 Wash                  | 78                       | 0                                                      | 17                    | 17                                           |
| <b>Total</b>              | <b>1,439</b>             | <b>1,519</b>                                           | <b>168</b>            | <b>244</b>                                   |

# Detention Basin WQCV Status



8 Existing Detention Basins with Stormwater Quality Features

5 Planned Detention Basins with Stormwater Quality Features

2 Existing Detention Basins with Potential Stormwater Quality Features

# Land Use Percent Impervious Changes

Percent Imperviousness of Developed Area Evaluation for each Permit Year based on 2018 MPU values considering directly connected impervious areas

| Land Use                                                           | 2008 Impervious (%) | 2018 Impervious (%) |
|--------------------------------------------------------------------|---------------------|---------------------|
| Undeveloped Land, Open Desert                                      | 0                   | 0                   |
| Parks, Golf Courses                                                | 5                   | 5                   |
| Rural, 0.5-1 units per acre (uses 1 unit/acre)                     | 20                  | 20                  |
| Low Density Residential, 1-2 units per acre (uses 2 units/acre)    | 25                  | 25                  |
| Medium-Density Residential, 2-4 units per acre (uses 3 units/acre) | 29                  | 30                  |
| High-Density Residential, 4-8 units per acre (uses 6 units/acre)   | 62                  | 52                  |
| Public Facility and residential, 8-12 units/acre                   | 72                  | 72                  |
| Very High-Density Residential, 12 units/acre or more               | 85                  | 80                  |
| Commercial, Retail, Casino, High Rise Condominiums                 | 90                  | 85                  |
| Light Industrial                                                   | 70                  | 72                  |
| Heavy Industrial                                                   | 85                  | 85                  |
| Schools                                                            | 50                  | 50                  |
| Lakes                                                              | 0                   | 0                   |

# Re-evaluation of Imperviousness for New Developments by Permit Year

| Permit Year | New Development (acres) |                        |                        |                       |
|-------------|-------------------------|------------------------|------------------------|-----------------------|
|             | Annual Total            | Annual (Re-evaluated*) | Annual Impervious area | Impervious Percentage |
| 2013 - 2014 | 950                     | 935                    | 583                    | 61.80%                |
| 2014 - 2015 | 1,119                   | 1,090                  | 553                    | 50.00%                |
| 2015 - 2016 | 1,449                   | 1,428                  | 863                    | 60.10%                |
| 2016 - 2017 | 1,898                   | 1,848                  | 1,104                  | 58.90%                |
| 2017 - 2018 | 2,450                   | 2,412                  | 1,513                  | 62.40%                |
| 2018 - 2019 | 2,654                   | 2,594                  | 1,593                  | 60.30%                |
| 2019 - 2020 | 1,518                   | 1,509                  | 963                    | 63.70%                |
| 2013 - 2020 | 12,038                  | 11,816                 | 7,175                  | 60.10%                |

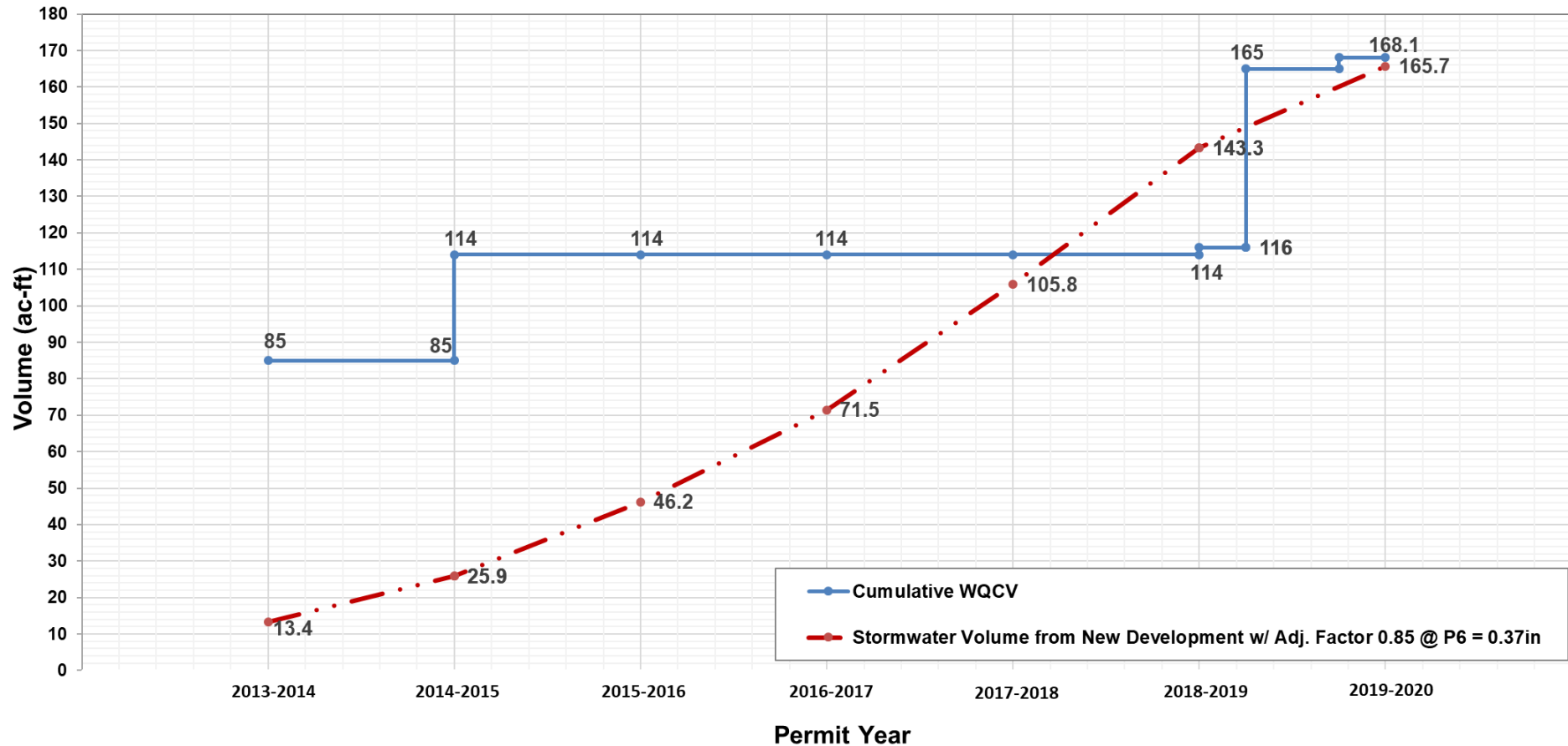
\*Removing 1 AC or less and analysis of large parcels

Planned % Impervious = 50%

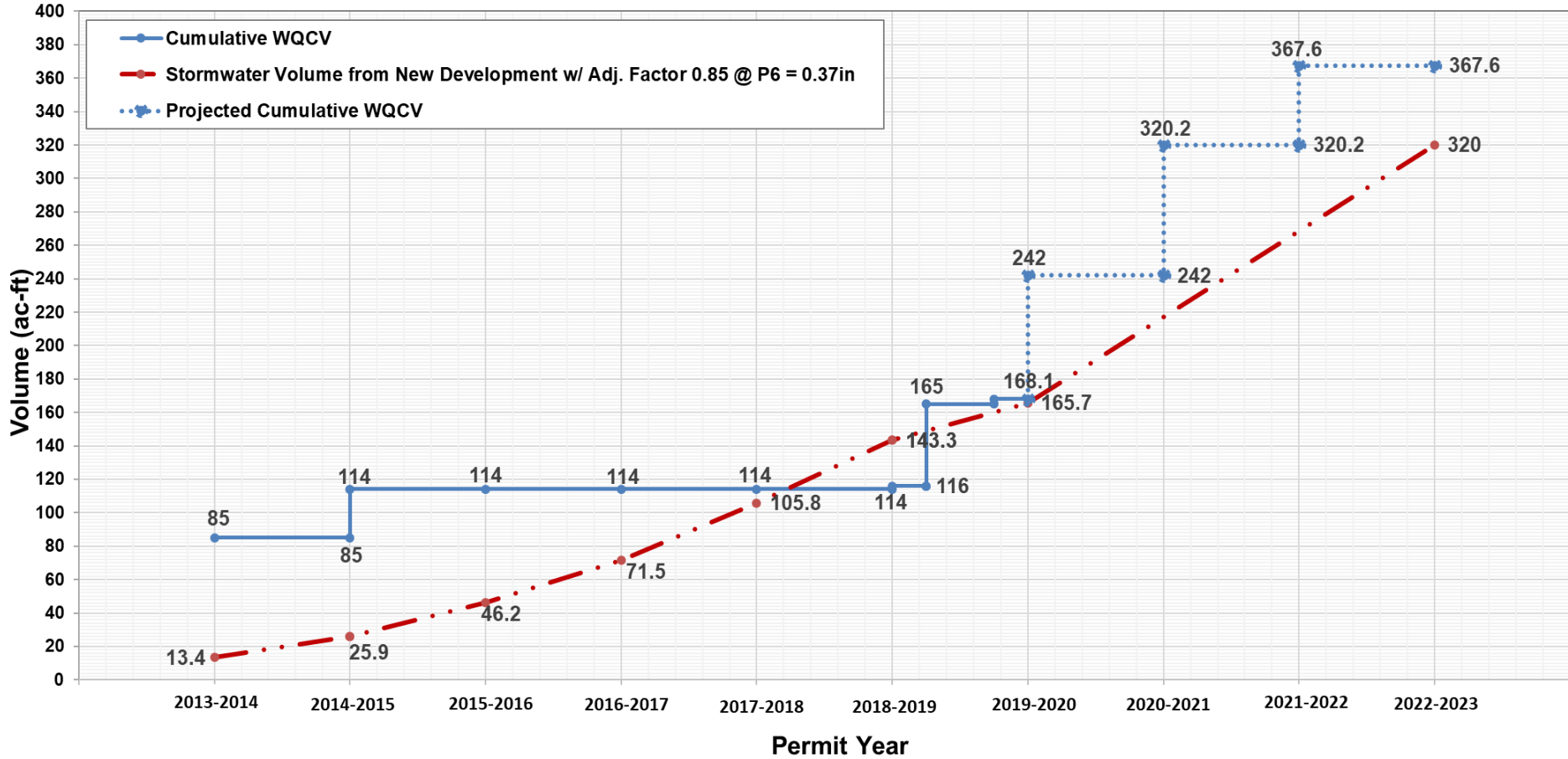
# Re-evaluated NDSR Stormwater Volume (2013 to 2020)

| Permit Year | Rainfall Depth = 0.37 inches                    |                                                                      |
|-------------|-------------------------------------------------|----------------------------------------------------------------------|
|             | NDSR Stormwater Volume From Annual Reports (AF) | Re-evaluated NDSR Stormwater Volume with Adjustment Factor 0.85 (AF) |
| 2013-2014   | 16.9                                            | 13.4                                                                 |
| 2014-2015   | 57.3                                            | 25.9                                                                 |
| 2015-2016   | 74.5                                            | 46.2                                                                 |
| 2016-2017   | 91.5                                            | 71.5                                                                 |
| 2017-2018   | 114.6                                           | 105.8                                                                |
| 2018-2019   | 137.3                                           | 143.3                                                                |
| 2019-2020   | 157.4                                           | 165.7                                                                |

# Detention Basin Stormwater Features WQCV vs Required Stormwater Volume from New Development (2013 to 2020)

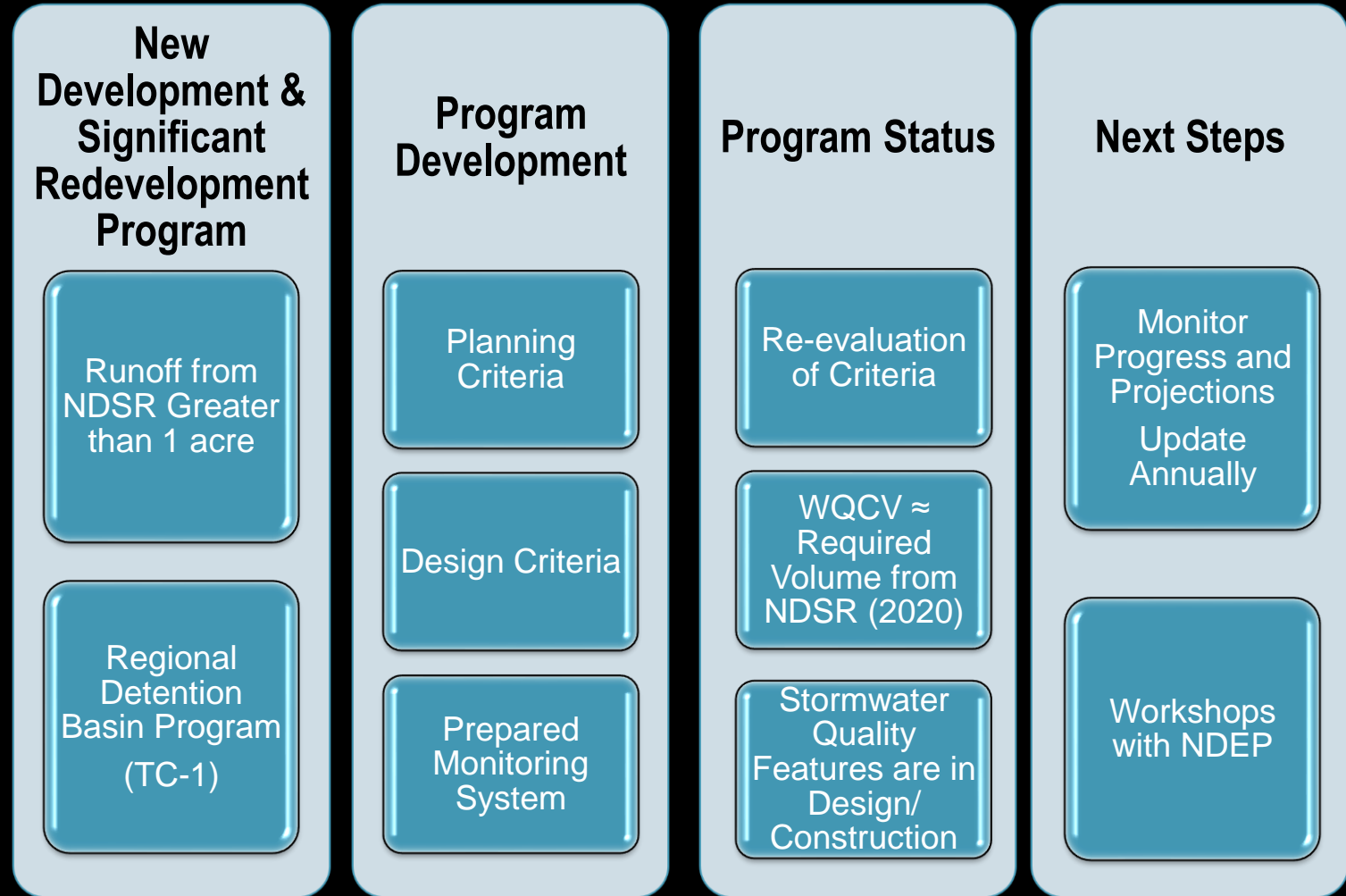


# Detention Basin Stormwater Features WQCV vs Required Stormwater Volume from New Development Projections (2013 to 2023)





# Summary of Regional Detention Basin Program



HDR