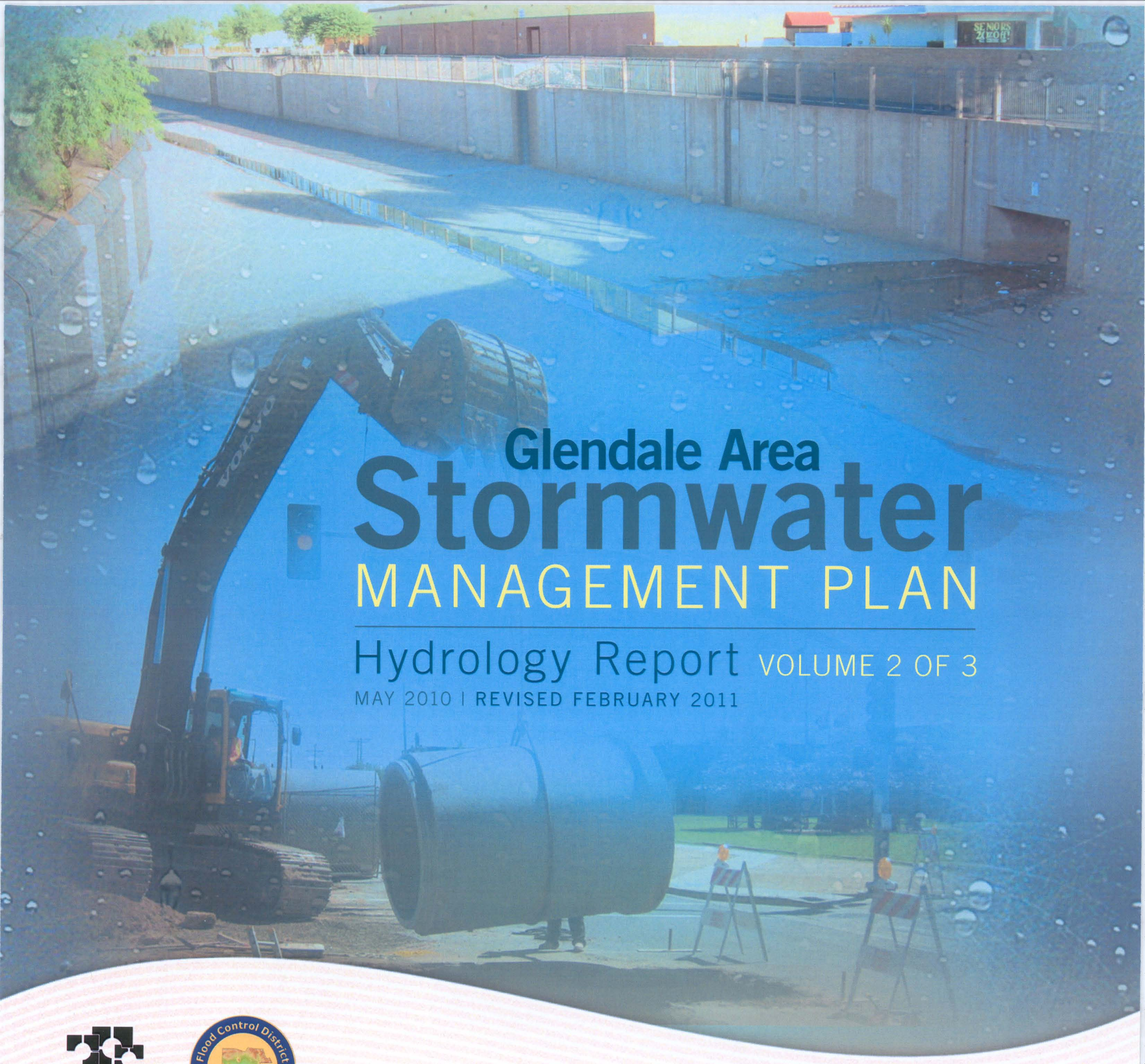


Glendale Area Stormwater MANAGEMENT PLAN

Hydrology Report VOLUME 2 OF 3

MAY 2010 | REVISED FEBRUARY 2011

GLENDALE AZ

Flood Control District of Maricopa County

Prepared for: City of Glendale and the Flood Control District of Maricopa County

Kimley-Horn and Associates, Inc.

Kimley-Horn and Associates, Inc.

GLENDALE AREA STORMWATER MANAGEMENT PLAN

HYDROLOGY REPORT VOLUME 2 OF 3

MARYVALE ADMS WATERSHED AND GLENDALE/PEORIA ADMPU WATERSHED

FINAL

Prepared for:
City of Glendale
5850 W. Glendale Ave., Ste. 315
Glendale, AZ 85301

In Association with
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, AZ 85009

Prepared by:
Kimley-Horn and Associates, Inc.
7878 North 16th Street
Suite 300
Phoenix, AZ 85020

091910009
May 2010
Revised February 2011

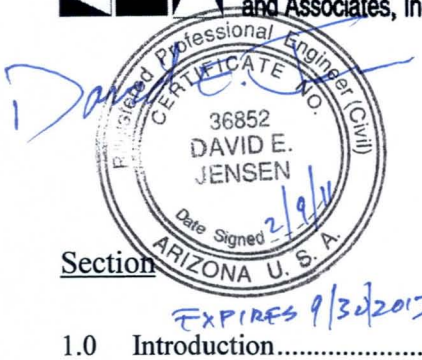
Copyright © 2011, Kimley-Horn and Associates, Inc.

Registered Professional Engineer (Civil) CERTIFICATE NO. 36852 DAVID E. JENSEN Date Signed 2/9/11 ARIZONA U.S.A.

EXPIRES 9/30/2013

Registered Professional Engineer (Civil) CERTIFICATE NO. 50746 MELANIE A. FIFE Date Signed 2/9/11 ARIZONA, U.S.A. Expires 03-31-2013

This document, together with the concepts and designs presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by Kimley-Horn and Associates, Inc., shall be without liability to Kimley-Horn and Associates, Inc.



EXPIRES 9/30/2013

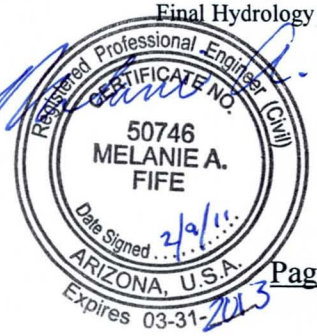


TABLE OF CONTENTS

Volume 1

Section Page No.

1.0 Introduction 1
- 1.1 Purpose 1
- 1.2 Contact Information 1
- 1.3 Location 2
- 1.4 General Description 2

2.0 Previous Hydrologic Investigations 6
- 2.1 Drainage Reports 6
- 2.2 As-Built Plans 7

3.0 Nomenclature 8

4.0 Hydrologic Parameters 10
- 4.1 General Model Description 10
- 4.2 Rainfall Data 11
- 4.3 Topographic Mapping 11
- 4.4 Subbasin Delineation 13
- 4.5 Flow paths and Times of Concentration 13
- 4.6 Land Use 14
- 4.7 Soils 15
- 4.8 Rainfall Loss Parameters 15
- 4.9 Retention 15
- 4.10 Storage Routing 16
- 4.11 Channel Routing 18
- 4.12 Diversions 21
  - 4.12.1 Storm Drain Diversions 21
  - 4.12.2 Multiple Street Diversions 21
  - 4.12.3 Single Street Intersection Diversions 22
  - 4.12.4 Parallel Street Diversions 22
  - 4.12.5 Topographic Diversions 24
  - 4.12.6 Channel Capacity Diversions 24
- 4.13 Cumulative Area for Areal Reduction 26

5.0 Significant Drainage Features 27
- 5.1 Grand Avenue 27
- 5.2 Grand Canal 27
- 5.3 Bethany Home Outfall Channel 28
- 5.4 Arizona Canal Diversion Channel 29
- 5.5 Arrowhead Lakes 29

6.0 Verification and Conclusions 31
- 6.1 Comparisons with Previous Studies 31
- 6.2 Verification Using Regression Analysis 31
- 6.3 Conclusions 32

7.0 References 33

EXPIRES 9/30/2013

TABLE OF CONTENTS (continued)

Volume 1 (continued)

List of Tables

Table 1. Boundary Abbreviations 8
Table 2. Prefixes for Modeling Operations 9
Table 3. Maryvale ADMS Regional Detention Basins 17
Table 4. Glendale/Peoria ADMPU Regional Detention Basins. 18
Table 5. Roughness Coefficients. 19
Table 6. Storage Routing Upstream of Grand Avenue. 27
Table 7. Storage Routing Upstream of the Grand Canal. 28
Table 8. Storage Routing Along the Bethany Home Outfall Channel. 29
Table 9. Comparison of Attenuation from Arrowhead Lakes. 30

List of Figures

Figure 1. Vicinity Map 3
Figure 2. Typical Maryvale ADMS Watershed Subbasin Schematic 10
Figure 3. FCDMC Mapping Sources 12
Figure 4. Typical Parallel Street Diversion within the Maryvale ADMS Watershed 23
Figure 5. Typical Parallel Street Diversion within the Glendale/Peoria ADMPU Watershed. 24

EXPIRES 9/30/2013

TABLE OF CONTENTS (CONTINUED)

Volume 1 (continued)

List of Appendices

Appendix A Maryvale ADMS Area DDMSW Data
- Rainfall Data
- Existing and Future Subbasin Data
- Existing and Future Land Use by Subbasin
- Soils by Subbasin

Appendix B Glendale/Peoria ADMPU Area DDMSW Data
- Rainfall Data
- Subbasin Slope Adjustments
- Existing and Future Subbasin Data
- Existing and Future Land Use by Subbasin
- Soils by Subbasin

Appendix C Land Use Data
- Comparison of Glendale and Phoenix Land Use with MAG
- DDMSW Land Use Defaults
- Land Use Parameters Documentation

Appendix D Retention Calculations
- Maryvale ADMS Area Calculations
- Glendale/Peoria ADMPU Area Calcuations

Appendix E Storage Routing Calculations
- Arrowhead Lakes Map and Calculations
- Regional Detention Basins Calculations

Appendix F Typical Street and Channel Sections
- Typical Channel Sections Summary
- Typical Street Sections Summary
- City of Glendale Typical Street Sections
- City of Phoenix Typical Street Sections
- City of Peoria Typical Street Sections

Appendix G Routing and Diversion Data
- Maryvale ADMS Area Data
- Glendale/Peoria ADMPU Area Data

Appendix H Cumulative Area Calculations
- Maryvale ADMS Area Calculations
- Glendale/Peoria ADMPU Area Calculations

Appendix I HEC-1 Model Results
- Maryvale ADMS Area Model Results
- Glendale/Peoria ADMPU Area Model Results

EXPIRES 9/30/2013

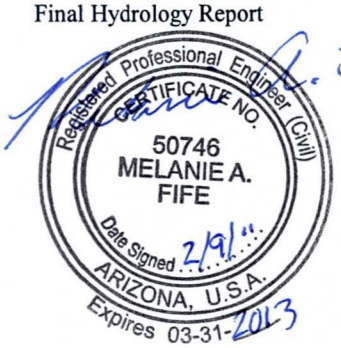


TABLE OF CONTENTS (CONTINUED)

Volume 2

List of Appendices

Appendix J Exhibits

List of Exhibits in Appendix J

Exhibit 1. Existing Conditions HEC-1 Schematic

Exhibit 2. Future Conditions HEC-1 Schematic

Exhibit 3. Subbasin Delineation Map

Exhibit 4. Existing Conditions Land Use Map

Exhibit 5. Future Conditions Land Use Map

Exhibit 6. Soils Map

Exhibit 7. Pre- and Post-1990 Developed Areas Map

Exhibit 8. Pipe Routing Map

Exhibit 9. Hydrology Results for the Existing Conditions 100-Year Storm Event

Exhibit 10. Hydrology Results for the Future Conditions 100-Year Storm Event

Exhibit 11. Hydrology Results for the 10-Year Storm Event

EXPIRES 9/30/2013

TABLE OF CONTENTS (CONTINUED)

Volume 3

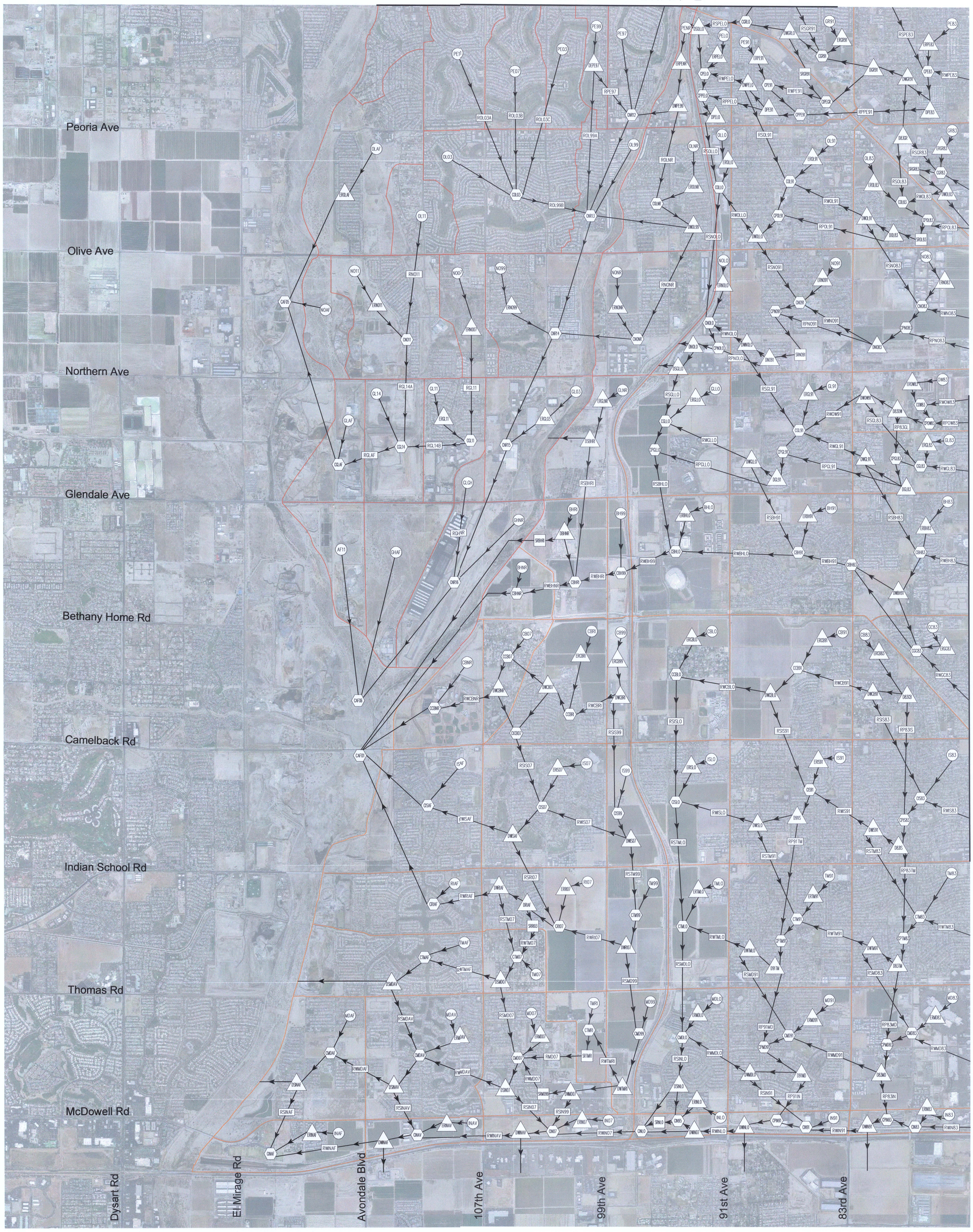
List of Models

File Name	Description
MV6E100	Maryvale ADMS Area Existing Conditions 100-Year, 6-Hour Storm
GP6E100	Glendale/Peoria ADMPU Area Existing Conditions 100-Year, 6-Hour Storm
MV24E100	Maryvale ADMS Area Existing Conditions 100-Year, 24-Hour Storm
GP24E100	Glendale/Peoria ADMPU Area Existing Conditions 100-Year, 24-Hour Storm
MV6E10	Maryvale ADMS Area Existing Conditions 10-Year, 6-Hour Storm
GP6E10	Glendale/Peoria ADMPU Area Existing Conditions 10-Year, 6-Hour Storm
MV24E10	Maryvale ADMS Area Existing Conditions 10-Year, 24-Hour Storm
GP24E10	Glendale/Peoria ADMPU Area Existing Conditions 10-Year, 24-Hour Storm
MV6F100	Maryvale ADMS Area Future Conditions 100-Year, 6-Hour Storm
GP6F100	Glendale/Peoria ADMPU Area Future Conditions 100-Year, 6-Hour Storm
MV24F100	Maryvale ADMS Area Future Conditions 100-Year, 24-Hour Storm
GP24F100	Glendale/Peoria ADMPU Area Future Conditions 100-Year, 24-Hour Storm
MV6F10	Maryvale ADMS Area Future Conditions 10-Year, 6-Hour Storm
GP6F10	Glendale/Peoria ADMPU Area Future Conditions 10-Year, 6-Hour Storm
MV24F10	Maryvale ADMS Area Future Conditions 10-Year, 24-Hour Storm
GP24F10	Glendale/Peoria ADMPU Area Future Conditions 10-Year, 24-Hour Storm

Appendix J Exhibits

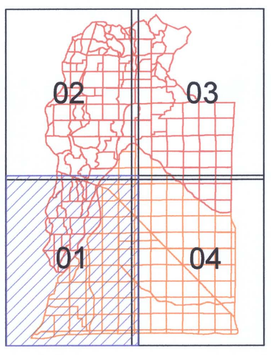
K:\PHX_WaterResources\091910009\CADD\HEC-1_Schematics\Exhibit1_Maryvale_GP_existing.dwg Apr 15, 2010 zachary.schmidt
XREFS: x910009_Aerial Exhibit1_Maryvale_existing Exhibit1_GlendalePeoria_existing
THIS DOCUMENT, TOGETHER WITH THE CONCEPTS AND DESIGNS PRESENTED HEREIN, AS AN INSTRUMENT OF SERVICE, IS INTENDED ONLY FOR THE SPECIFIC PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. REUSE OF AND IMPROPER RELIANCE ON THIS DOCUMENT WITHOUT WRITTEN AUTHORIZATION AND ADAPTATION BY KIMLEY-HORN AND ASSOCIATES, INC. SHALL BE WITHOUT LIABILITY TO KIMLEY-HORN AND ASSOCIATES, INC.

MATCHLINE SHEET 2



MATCHLINE SHEET 4

LEGEND



- FLOW DIRECTION
- STORAGE ROUTE (SRM099)
- SUBBASIN (INAF)
- DIVERT (ERINAF)
- ROUTE (RWINAF)
- COMBINATION POINT (CINAF)

SUBBASIN BOUNDARY

- SUBBASINS WITHIN THE MARYVALE ADMS WATERSHED
- SUBBASINS WITHIN THE GLENDALE/PEORIA ADMPU WATERSHED

0 1,000 2,000 4,000

1 OF 4	
DRAWING NAME	EXHIBIT 1
PROJECT NO.	091910009

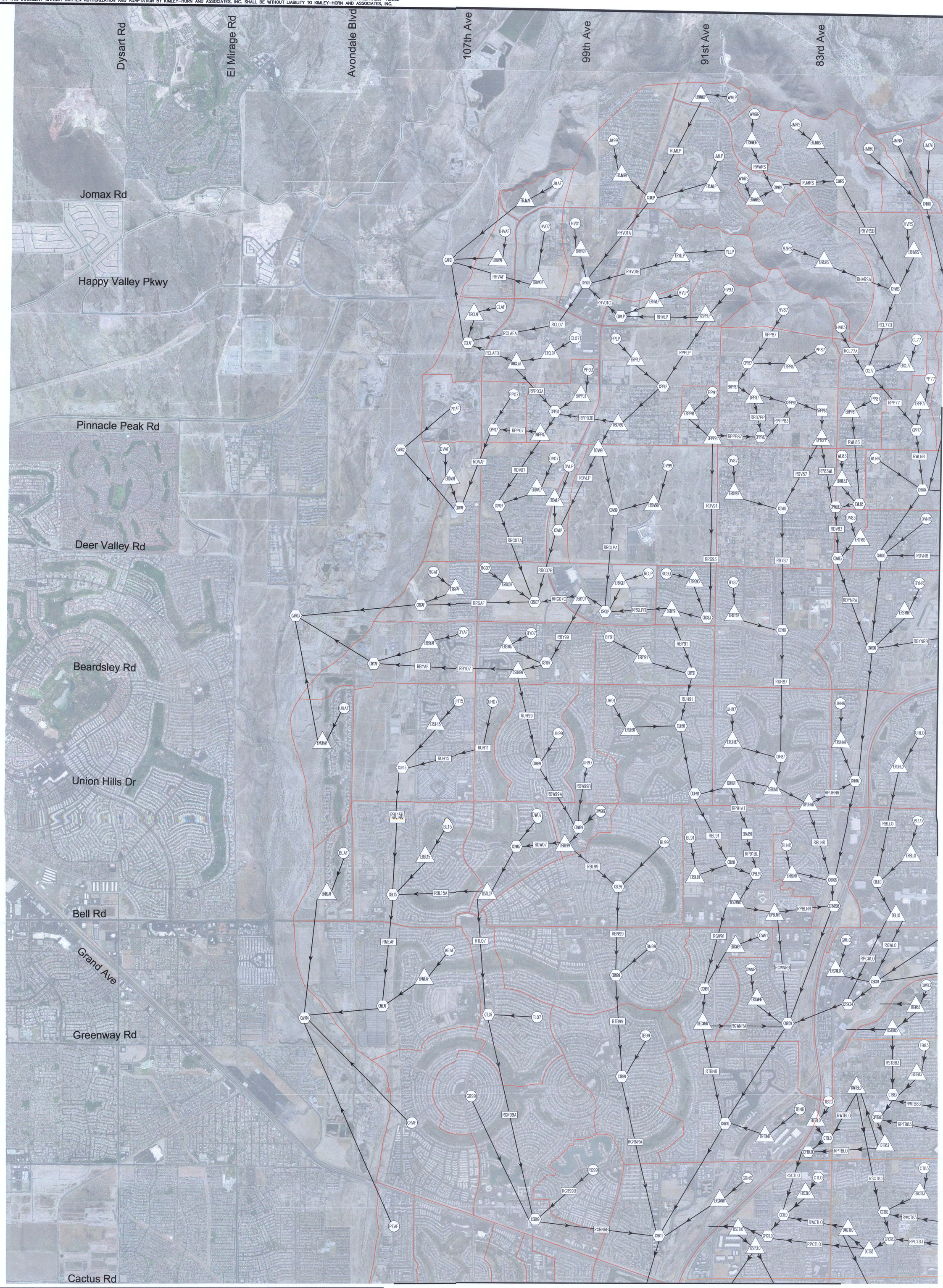
GLENDALE AREA STORMWATER MANAGEMENT PLAN EXHIBIT 1. EXISTING CONDITIONS HEC-1 SCHEMATIC

SCALE (H): 2000'
SCALE (V): NONE
DESIGNED BY: LAT
DRAWN BY: LAT
CHECKED BY: MAF
DATE: APRIL 2010

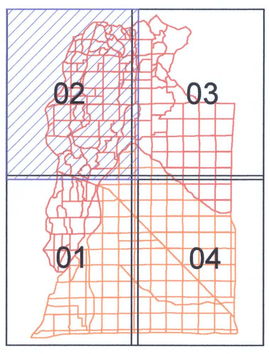
Kimley-Horn and Associates, Inc.
© 2010 KIMLEY-HORN AND ASSOCIATES, INC.
7878 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

NO.	REVISION	BY	DATE	APPR.

K:\PHX_WaterResources\091910009\CADD\HEC-1_Schematics\Exhibit1_Maryvale_GP_existing.dwg Apr 15, 2010 zachary.schmidt
XREFS: x910009_Aerial Exhibit1_Maryvale_existing Exhibit1_GlendalePeoria_existing
THIS DOCUMENT, TOGETHER WITH THE CONCEPTS AND DESIGNS PRESENTED HEREIN, AS AN INSTRUMENT OF SERVICE, IS INTENDED ONLY FOR THE SPECIFIC PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. REUSE OF AND IMPROPER RELIANCE ON THIS DOCUMENT WITHOUT WRITTEN AUTHORIZATION AND ADAPTATION BY KIMLEY-HORN AND ASSOCIATES, INC. SHALL BE WITHOUT LIABILITY TO KIMLEY-HORN AND ASSOCIATES, INC.



LEGEND



- FLOW DIRECTION
- STORAGE ROUTE (SRMD99)
- SUBBASIN (INAF)
- DIVERT (ERINAF)
- ROUTE (RWINAF)
- COMBINATION POINT (CINAF)

SUBBASIN BOUNDARY
- SUBBASINS WITHIN THE MARYVALE ADMS WATERSHED
- SUBBASINS WITHIN THE GLENDALE/PEORIA ADMPU WATERSHED

0 1,000 2,000 4,000

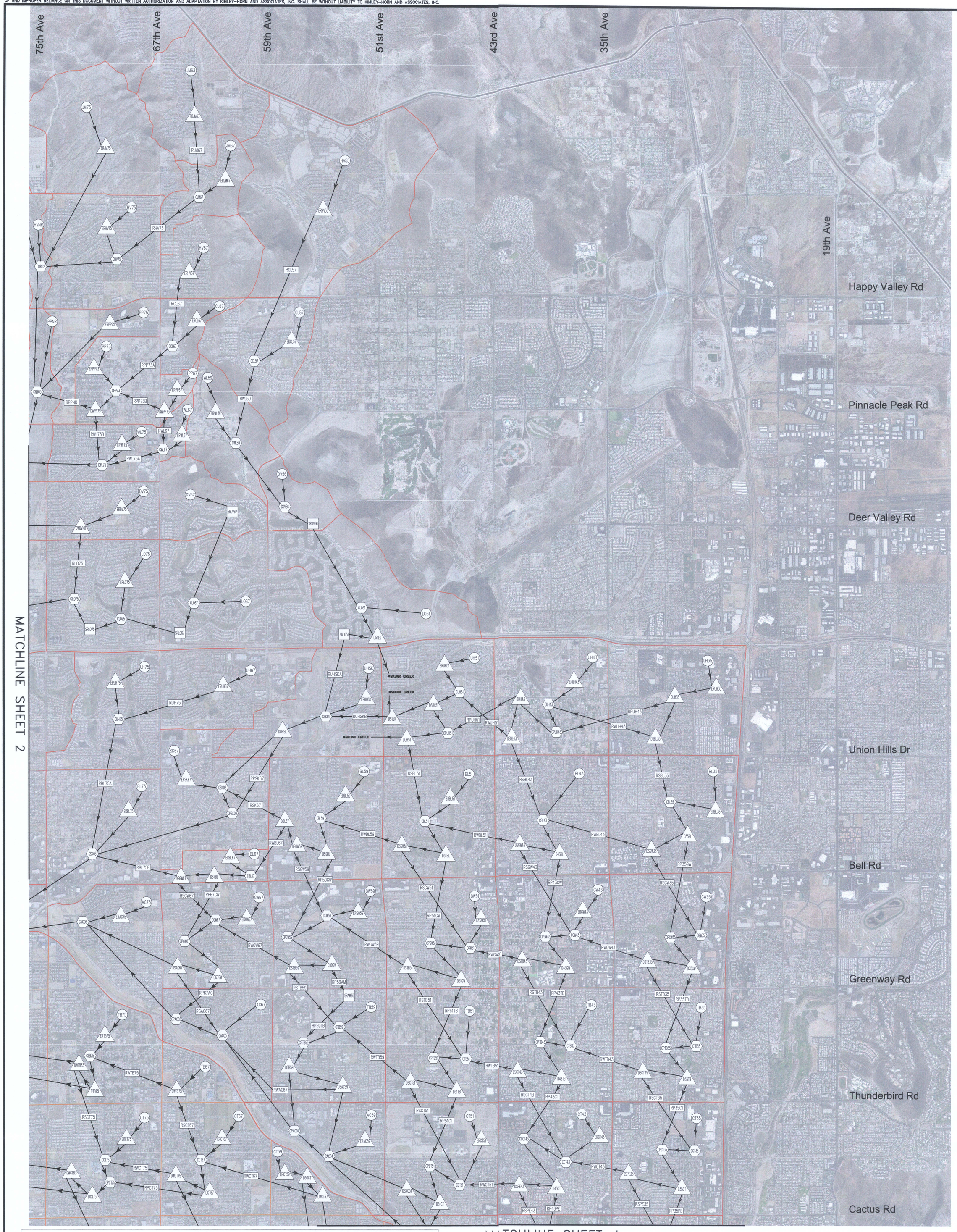
2 OF 4	PROJECT NO. 091910009	DRAWING NAME EXHIBIT 1	GLENDALE AREA STORMWATER MANAGEMENT PLAN EXHIBIT 1. EXISTING CONDITIONS HEC-1 SCHEMATIC

SCALE (H): 2000'
SCALE (V): NONE
DESIGNED BY: LAT
DRAWN BY: LAT
CHECKED BY: MAF
DATE: APRIL 2010

Kimley-Horn and Associates, Inc.
© 2010 KIMLEY-HORN AND ASSOCIATES, INC.
7878 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

NO.	REVISION	BY	DATE	APPR.

K:\PHX_WaterResources\091910009\CADD\HEC-1_Schematics\Exhibit1_Maryvale_GP_existing.dwg Oct 07, 2010 zachary.schmidt
XREFS: x910009_Aerial Exhibit1_Maryvale_existing Exhibit1_GlendalePeoria_existing
THIS DOCUMENT, TOGETHER WITH THE CONCEPTS AND DESIGNS PRESENTED HEREIN, AS AN INSTRUMENT OF SERVICE, IS INTENDED ONLY FOR THE SPECIFIC PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. REUSE OF AND IMPROPER RELIANCE ON THIS DOCUMENT WITHOUT WRITTEN AUTHORIZATION AND ADAPTATION BY KIMLEY-HORN AND ASSOCIATES, INC. SHALL BE WITHOUT LIABILITY TO KIMLEY-HORN AND ASSOCIATES, INC.



MATCHLINE SHEET 2

MATCHLINE SHEET 4

LEGEND

- FLOW DIRECTION
- SRM099 — STORAGE ROUTE
- INAF — SUBBASIN
- ERINAF — DIVERT
- RWINAF — ROUTE
- CINAF — COMBINATION POINT

SUBBASIN BOUNDARY

- SUBBASINS WITHIN THE MARYVALE ADMS WATERSHED
- SUBBASINS WITHIN THE GLENDALE/PEORIA ADMPU WATERSHED

0 1,000 2,000 4,000

3 OF 4

PROJECT NO. 091910009

DRAWING NAME EXHIBIT 1

GLENDALE AREA STORMWATER MANAGEMENT PLAN EXHIBIT 1. EXISTING CONDITIONS HEC-1 SCHEMATIC

SCALE (H): 2000'
SCALE (V): NONE
DESIGNED BY: LAT
DRAWN BY: LAT
CHECKED BY: MAF
DATE: 9/10

Kimley-Horn and Associates, Inc.
© 2010 KIMLEY-HORN AND ASSOCIATES, INC.
7878 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

NO.	REVISION	BY	DATE	APPR.
	REVISION		02/11	

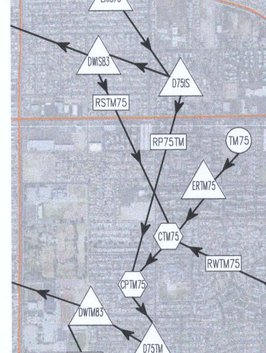
K:\PHX_WaterResources\091910009\CADD\HEC-1_Schematics\Exhibit1_Maryvale_GP_existing.dwg Oct 07, 2010 zachary.schmidt
XREFS: x9100009_Aerial Exhibit1_Maryvale_existing Exhibit1_GlendalePeoria_existing
THIS DOCUMENT, TOGETHER WITH THE CONCEPTS AND DESIGNS PRESENTED HEREIN, AS AN INSTRUMENT OF SERVICE, IS INTENDED ONLY FOR THE SPECIFIC PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. REUSE OF AND IMPROPER RELIANCE ON THIS DOCUMENT WITHOUT WRITTEN AUTHORIZATION AND ADAPTATION BY KIMLEY-HORN AND ASSOCIATES, INC. SHALL BE WITHOUT LIABILITY TO KIMLEY-HORN AND ASSOCIATES, INC.

MATCHLINE SHEET 3

MATCHLINE SHEET 1

Peoria Ave
Dunlap Ave
Northern Ave
Glendale Ave
Bethany Home Rd
Camelback Rd
Indian School Rd
Thomas Rd
McDowell Rd
Grand Avenue
Van Buren St
75th Ave
67th Ave
59th Ave
51st Ave
43rd Ave
35th Ave
27th Ave
19th Ave

LEGEND



- FLOW DIRECTION
- STORAGE ROUTE (SRM099)
- SUBBASIN (INAF)
- DIVERT (ERINAF)
- ROUTE (RWINAF)
- COMBINATION POINT (CINAF)

SUBBASIN BOUNDARY

- SUBBASINS WITHIN THE MARYVALE ADMS WATERSHED
- SUBBASINS WITHIN THE GLENDALE/PEORIA ADMPU WATERSHED

0 1,000 2,000 4,000

4 OF 4

DRAWING NAME EXHIBIT 1

PROJECT NO. 091910009

GLENDALE AREA STORMWATER MANAGEMENT PLAN EXHIBIT 1. EXISTING CONDITIONS HEC-1 SCHEMATIC

SCALE (H): 2000'
SCALE (V): NONE

DESIGNED BY: LAT
DRAWN BY: LAT
CHECKED BY: MAF

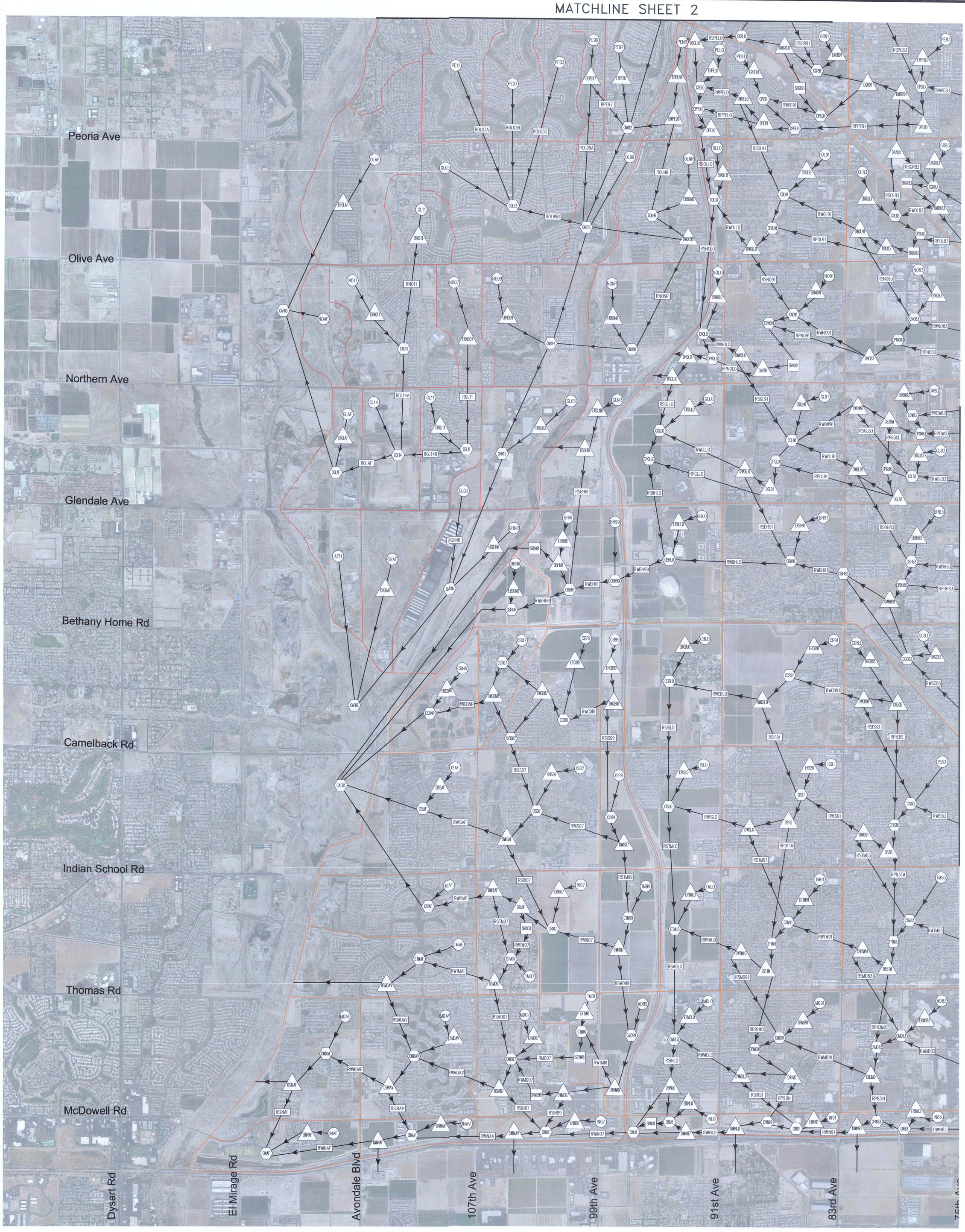
DATE: 9/10

Kimley-Horn and Associates, Inc.
© 2010 KIMLEY-HORN AND ASSOCIATES, INC.
7878 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

NO.	REVISION	BY	DATE	APPR.
	REVISION		02/11	

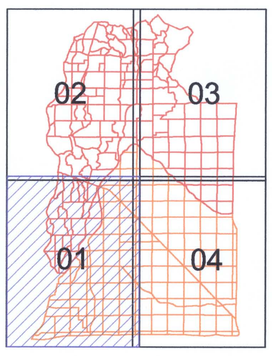
K:\PHX_WaterResources\091910009\CADD\HEC-1_Schematics\Exhibit1_Maryvale_GP_future.dwg May 20, 2010 melanie.fife
XREFS: x910009_Aerial Exhibit1_Maryvale_future Exhibit1_GlendalePeoria_future
THIS DOCUMENT, TOGETHER WITH THE CONCEPTS AND DESIGNS PRESENTED HEREIN, AS AN INSTRUMENT OF SERVICE, IS INTENDED ONLY FOR THE SPECIFIC PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. REUSE OF AND IMPROPER RELIANCE ON THIS DOCUMENT WITHOUT WRITTEN AUTHORIZATION AND ADAPTATION BY KIMLEY-HORN AND ASSOCIATES, INC. SHALL BE WITHOUT LIABILITY TO KIMLEY-HORN AND ASSOCIATES, INC.

MATCHLINE SHEET 2



MATCHLINE SHEET 4

LEGEND



- FLOW DIRECTION
- STORAGE ROUTE (SRMD99)
- SUBBASIN (INAF)
- DIVERT (ERINAF)
- ROUTE (RWINAF)
- COMBINATION POINT (CINAF)

SUBBASIN BOUNDARY

- SUBBASINS WITHIN THE MARYVALE ADMS WATERSHED
- SUBBASINS WITHIN THE GLENDALE/PEORIA ADMPU WATERSHED

0 1,000 2,000 4,000

1 OF 4

DRAWING NAME EXHIBIT 2

PROJECT NO. 091910009

GLENDALE AREA STORMWATER MANAGEMENT PLAN EXHIBIT 2. FUTURE CONDITIONS HEC-1 SCHEMATIC

SCALE (H): 2000'
SCALE (V): NONE

DESIGNED BY: LAT
DRAWN BY: LAT
CHECKED BY: MAF

DATE: APRIL 2010

Kimley-Horn and Associates, Inc.
© 2010 KIMLEY-HORN AND ASSOCIATES, INC.
7878 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

NO.	REVISION	BY	DATE	APPR.

K:\PHX_WaterResources\091910009\CADD\HEC-1_Schematics\Exhibit1_Maryvale_GP_future.dwg May 20, 2010 melanie.fife
XREFS: x910009_Aerial Exhibit1_Maryvale_future Exhibit1_GlendalePeoria_future
THIS DOCUMENT, TOGETHER WITH THE CONCEPTS AND DESIGNS PRESENTED HEREIN, AS AN INSTRUMENT OF SERVICE, IS INTENDED ONLY FOR THE SPECIFIC PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. REUSE OF AND IMPROPER RELIANCE ON THIS DOCUMENT WITHOUT WRITTEN AUTHORIZATION AND ADAPTATION BY KIMLEY-HORN AND ASSOCIATES, INC. SHALL BE WITHOUT LIABILITY TO KIMLEY-HORN AND ASSOCIATES, INC.

Dysart Rd
El Mirage Rd
Avondale Blvd
107th Ave
99th Ave
91st Ave
83rd Ave
Jomax Rd
Happy Valley Pkwy
Pinnacle Peak Rd
Deer Valley Rd
Beardsley Rd
Union Hills Dr
Bell Rd
Grand Ave
Greenway Rd
Cactus Rd

MATCHLINE SHEET 3

MATCHLINE SHEET 1

LEGEND

- FLOW DIRECTION
- STORAGE ROUTE (SRMD99)
- SUBBASIN (INAF)
- DIVERT (ERINAF)
- ROUTE (RWINAF)
- COMBINATION POINT (CNAF)

SUBBASIN BOUNDARY

- SUBBASINS WITHIN THE MARYVALE ADMS WATERSHED
- SUBBASINS WITHIN THE GLENDALE/PEORIA ADMPU WATERSHED

0 1,000 2,000 4,000

2 OF 4

DRAWING NAME EXHIBIT 2

PROJECT NO. 091910009

GLENDALE AREA STORMWATER MANAGEMENT PLAN EXHIBIT 2. FUTURE CONDITIONS HEC-1 SCHEMATIC

SCALE (H): 2000'
SCALE (V): NONE
DESIGNED BY: LAT
DRAWN BY: LAT
CHECKED BY: MAF
DATE: APRIL 2010

Kimley-Horn and Associates, Inc.
© 2010 KIMLEY-HORN AND ASSOCIATES, INC.
7878 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

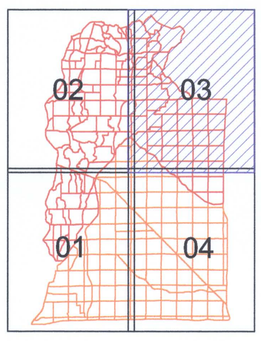
NO.	REVISION	BY	DATE	APPR.

K:\PHX_WaterResources\091910009\CADD\HEC-1_Schematics\Exhibit2_Maryvale_GP_future.dwg Oct 07, 2010 zachary.schmidt
XREFS: x910009_Aerial Exhibit1_Maryvale_future Exhibit1_GlendalePeoria_future
THIS DOCUMENT, TOGETHER WITH THE CONCEPTS AND DESIGNS PRESENTED HEREIN, AS AN INSTRUMENT OF SERVICE, IS INTENDED ONLY FOR THE SPECIFIC PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. REUSE OF AND IMPROPER RELIANCE ON THIS DOCUMENT WITHOUT WRITTEN AUTHORIZATION AND ADAPTATION BY KIMLEY-HORN AND ASSOCIATES, INC. SHALL BE WITHOUT LIABILITY TO KIMLEY-HORN AND ASSOCIATES, INC.

MATCHLINE SHEET 2

MATCHLINE SHEET 4

LEGEND



- FLOW DIRECTION
- STORAGE ROUTE (SRMD99)
- SUBBASIN (INAF)
- DIVERT (ERINAF)
- ROUTE (RWINAF)
- COMBINATION POINT (CINAF)

SUBBASIN BOUNDARY

- SUBBASINS WITHIN THE MARYVALE ADMS WATERSHED
- SUBBASINS WITHIN THE GLENDALE/PEORIA ADMPU WATERSHED

0 1,000 2,000 4,000

3 OF 4

DRAWING NAME: EXHIBIT 2

PROJECT NO.: 091910009

GLENDALE AREA STORMWATER MANAGEMENT PLAN EXHIBIT 2. FUTURE CONDITIONS HEC-1 SCHEMATIC

SCALE (H): 2000'
SCALE (V): NONE

DESIGNED BY: LAT
DRAWN BY: LAT
CHECKED BY: MAF

DATE: 9/10

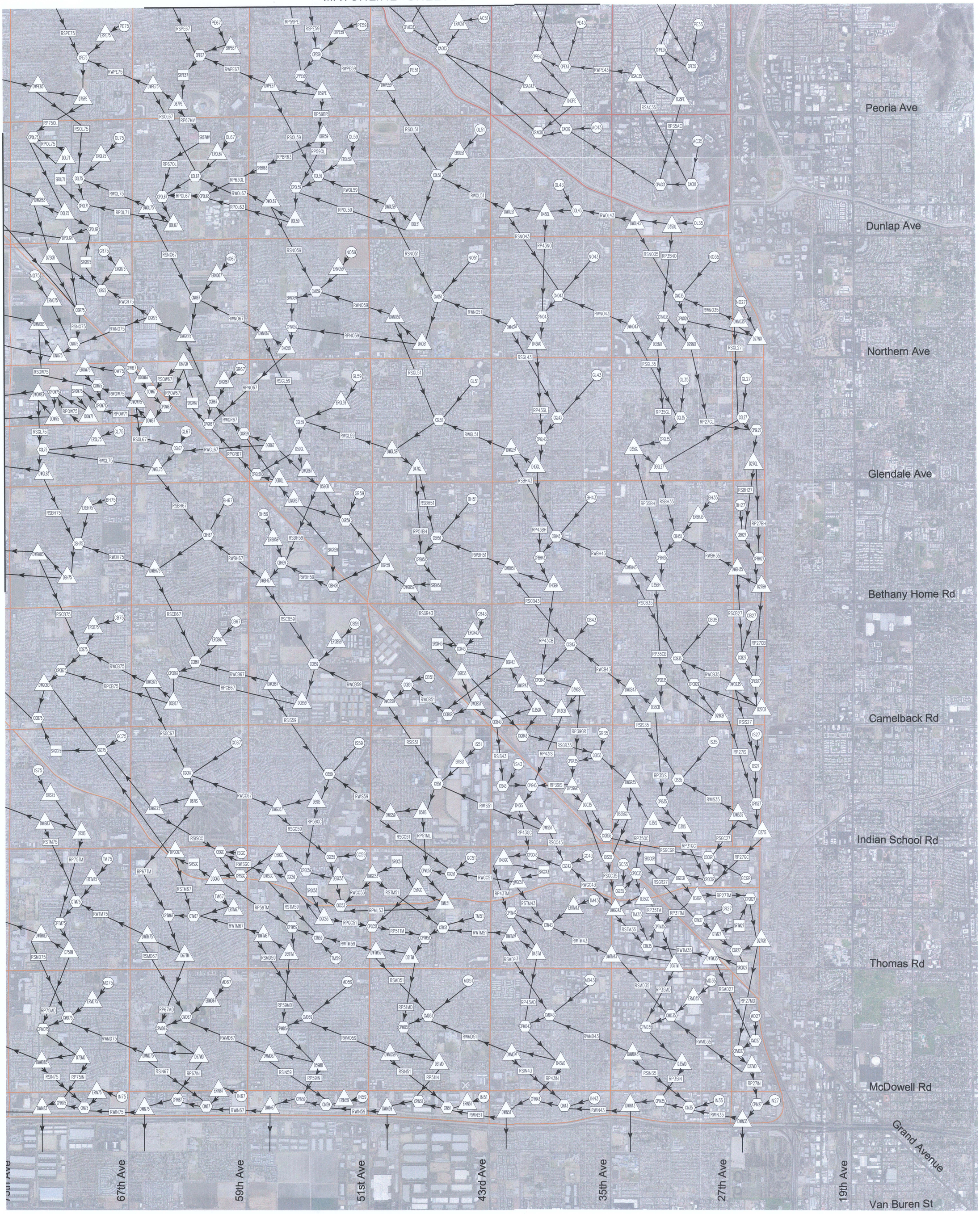
Kimley-Horn and Associates, Inc.
© 2010 KIMLEY-HORN AND ASSOCIATES, INC.
7878 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

NO.	REVISION	BY	DATE	APPR.
	REVISION		02/11	

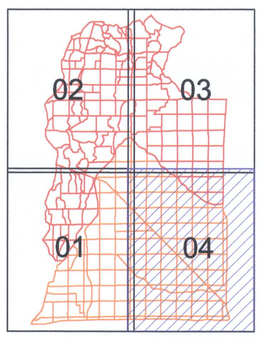
K:\PHX_WaterResources\091910009\CADD\HEC-1_Schematics\Exhibit2_Maryvale_GP_future.dwg Oct 07, 2010 zachary.schmidt
XREFS: x910009_Aerial Exhibit1_Maryvale_future Exhibit1_GlendalePeoria_future
THIS DOCUMENT, TOGETHER WITH THE CONCEPTS AND DESIGNS PRESENTED HEREIN, AS AN INSTRUMENT OF SERVICE, IS INTENDED ONLY FOR THE SPECIFIC PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. REUSE OF AND IMPROPER RELIANCE ON THIS DOCUMENT WITHOUT WRITTEN AUTHORIZATION AND ADAPTATION BY KIMLEY-HORN AND ASSOCIATES, INC. SHALL BE WITHOUT LIABILITY TO KIMLEY-HORN AND ASSOCIATES, INC.

MATCHLINE SHEET 3

MATCHLINE SHEET 1



LEGEND



- FLOW DIRECTION
- STORAGE ROUTE (SRM099)
- SUBBASIN (INAF)
- DIVERT (ERINAF)
- ROUTE (RWINAF)
- COMBINATION POINT (CINAF)

SUBBASIN BOUNDARY

- SUBBASINS WITHIN THE MARYVALE ADMS WATERSHED
- SUBBASINS WITHIN THE GLENDALE/PEORIA ADMPU WATERSHED

0 1,000 2,000 4,000

4 OF 4

DRAWING NAME EXHIBIT 2

PROJECT NO. 091910009

GLENDALE AREA STORMWATER MANAGEMENT PLAN EXHIBIT 2. FUTURE CONDITIONS HEC-1 SCHEMATIC

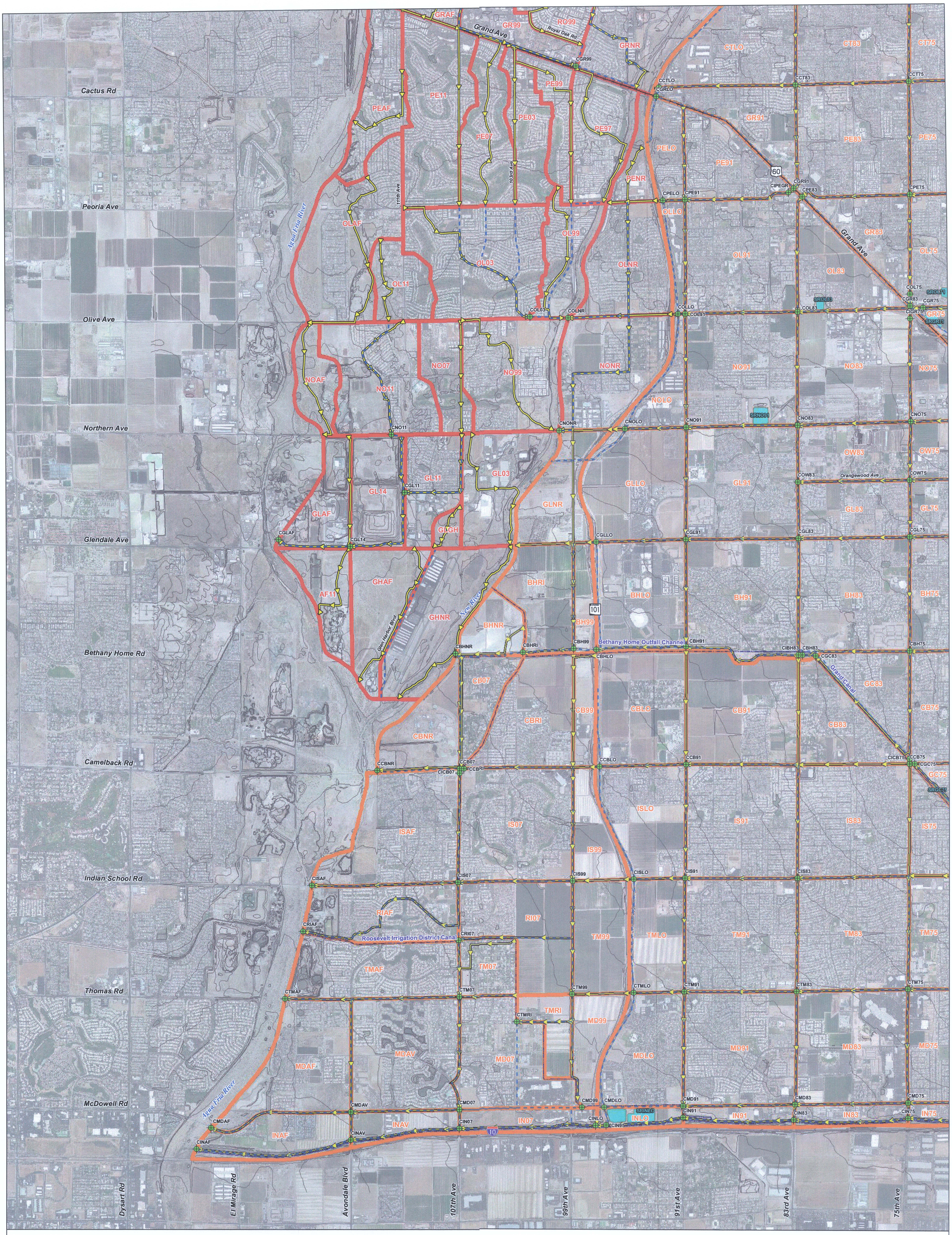
SCALE (H): 2000'
SCALE (V): NONE

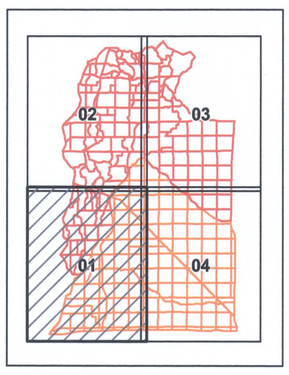
DESIGNED BY: LAT
DRAWN BY: LAT
CHECKED BY: MAF

DATE: 9/10

Kimley-Horn and Associates, Inc.
© 2010 KIMLEY-HORN AND ASSOCIATES, INC.
7878 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

NO.	REVISION	BY	DATE	APPR.
	REVISION		02/11	





0 1,000 2,000 4,000 Feet

Legend

- Regional Detention Basins
- 10 ft Contours
- Canal/Channel
- Railroad
- Concentration Point
- Surface Routing
- Time of Concentration Flow Paths

Subbasin Boundaries

- Glendale/Peoria ADMPU
- Maryvale ADMS

INO7 Subbasin Name
CNAF Concentration Point Name
CNAF Regional Detention Basin Name

SHEET 01 OF 04

DRAWING NAME: EXHIBIT_03_SUBBASIN DELINEATION_MAP.MXD

PROJECT NO. 091910009

GLENDALE AREA STORMWATER MANAGEMENT PLAN EXHIBIT 3. SUBBASIN DELINEATION MAP

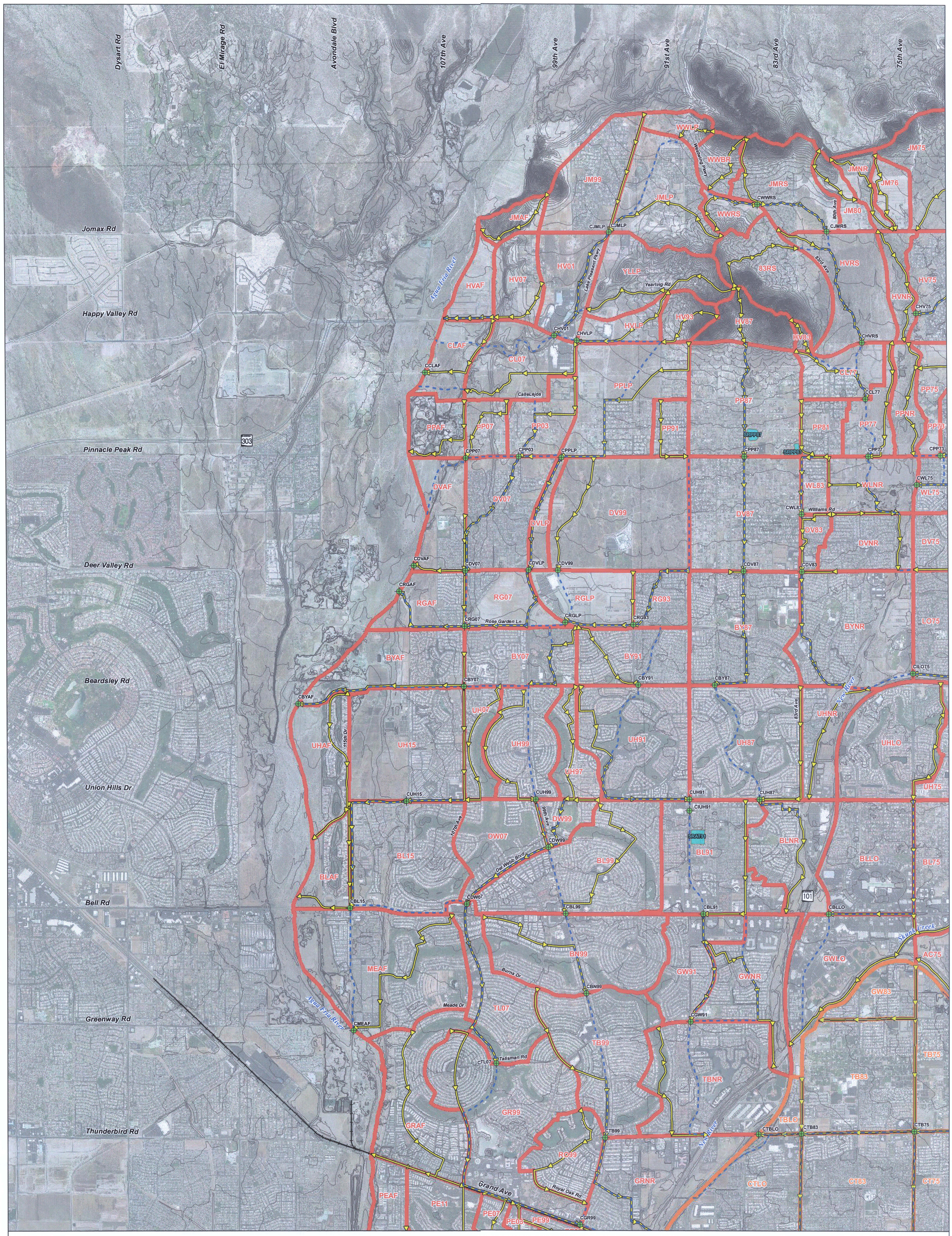
SCALE(H): 1"= 2000'
SCALE(V): NONE

DESIGNED BY: MAF
DRAWN BY: JAG
CHECKED BY: AOM

DATE: APRIL, 2010

Kimley-Horn and Associates, Inc.
© 2010 KIMLEY-HORN AND ASSOCIATES, INC.
Engineering, Planning and Environmental Consultants
7878 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

REVISION		02/11



0 1,000 2,000 4,000 Feet

Legend

- Regional Detention Basins
- 10 ft Contours
- Canal/Channel
- Railroad
- Concentration Point
- Surface Routing
- Time of Concentration Flow Paths

Subbasin Boundaries

- Glendale/Peoria ADMPU
- Maryvale ADMS

- INO7 Subbasin Name
- CNAF Concentration Point Name
- CNAF Regional Detention Basin Name

SHEET 02 OF 04

DRAWING NAME: EXHIBIT_03_SUBBASIN DELINEATION_MAP.MXD

PROJECT NO. 09191000

GLENDALE AREA STORMWATER MANAGEMENT PLAN EXHIBIT 3. SUBBASIN DELINEATION MAP

SCALE(H): 1"= 2000'
SCALE(V): NONE

DESIGNED BY: MAF
DRAWN BY: JAG
CHECKED BY: AOM

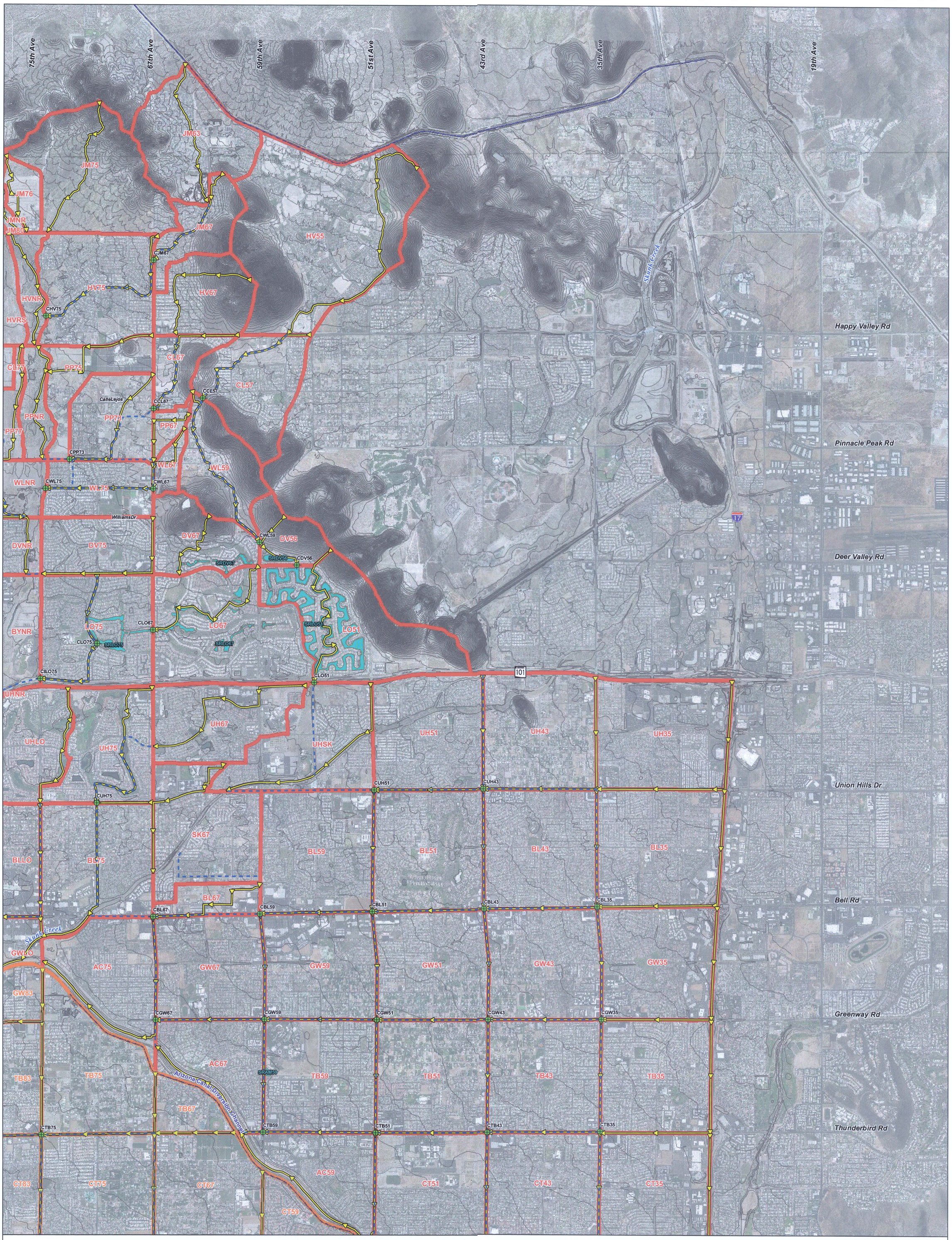
DATE: APRIL, 2010

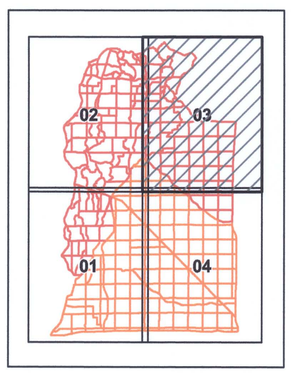
Kimley-Horn and Associates, Inc.

© 2010 KIMLEY-HORN AND ASSOCIATES, INC.

Engineering, Planning and Environmental Consultants

7878 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500





Legend

- Regional Detention Basins
- 10 ft Contours
- Canal/Channel
- Railroad
- Concentration Point
- Surface Routing
- Time of Concentration Flow Paths

Subbasin Boundaries

- Glendale/Peoria ADMPU
- Maryvale ADMS

- INO7 Subbasin Name
- CNAF Concentration Point Name
- CNAF Regional Detention Basin Name

0 1,000 2,000 4,000 Feet

SHEET 03 OF 04

DRAWING NAME: EXHIBIT_03_SUBBASIN DELINEATION_MAP.MXD

PROJECT NO. 091910009

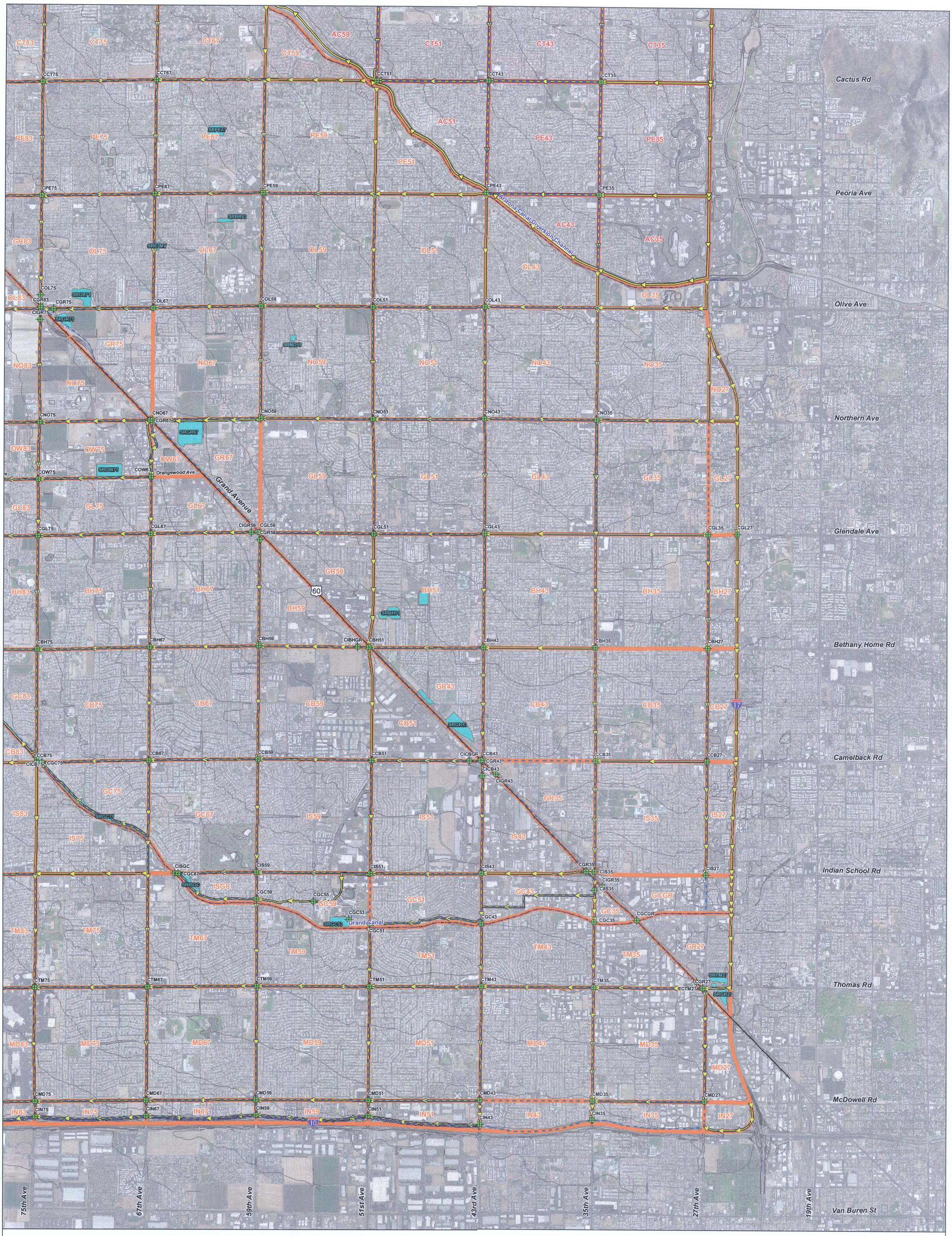
GLENDALE AREA STORMWATER MANAGEMENT PLAN EXHIBIT 3. SUBBASIN DELINEATION MAP

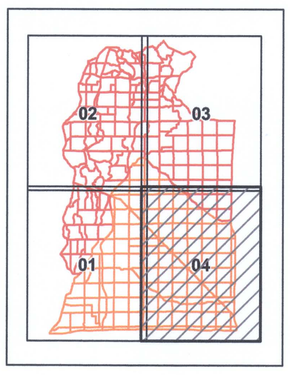
SCALE(H): 1"= 2000'
SCALE(V): NONE

DESIGNED BY: MAF
DRAWN BY: JAG
CHECKED BY: AOM

DATE: APRIL, 2010

Kimley-Horn and Associates, Inc.
© 2010 KIMLEY-HORN AND ASSOCIATES, INC.
Engineering, Planning and Environmental Consultants
7878 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500





0 1,000 2,000 4,000 Feet

Legend

- Regional Detention Basins
- 10 ft Contours
- Canal/Channel
- Railroad
- Concentration Point
- Surface Routing
- Time of Concentration Flow Paths

Subbasin Boundaries

- Glendale/Peoria ADMPU
- Maryvale ADMS

INO7 Subbasin Name
CNAF Concentration Point Name
CNAF Regional Detention Basin Name

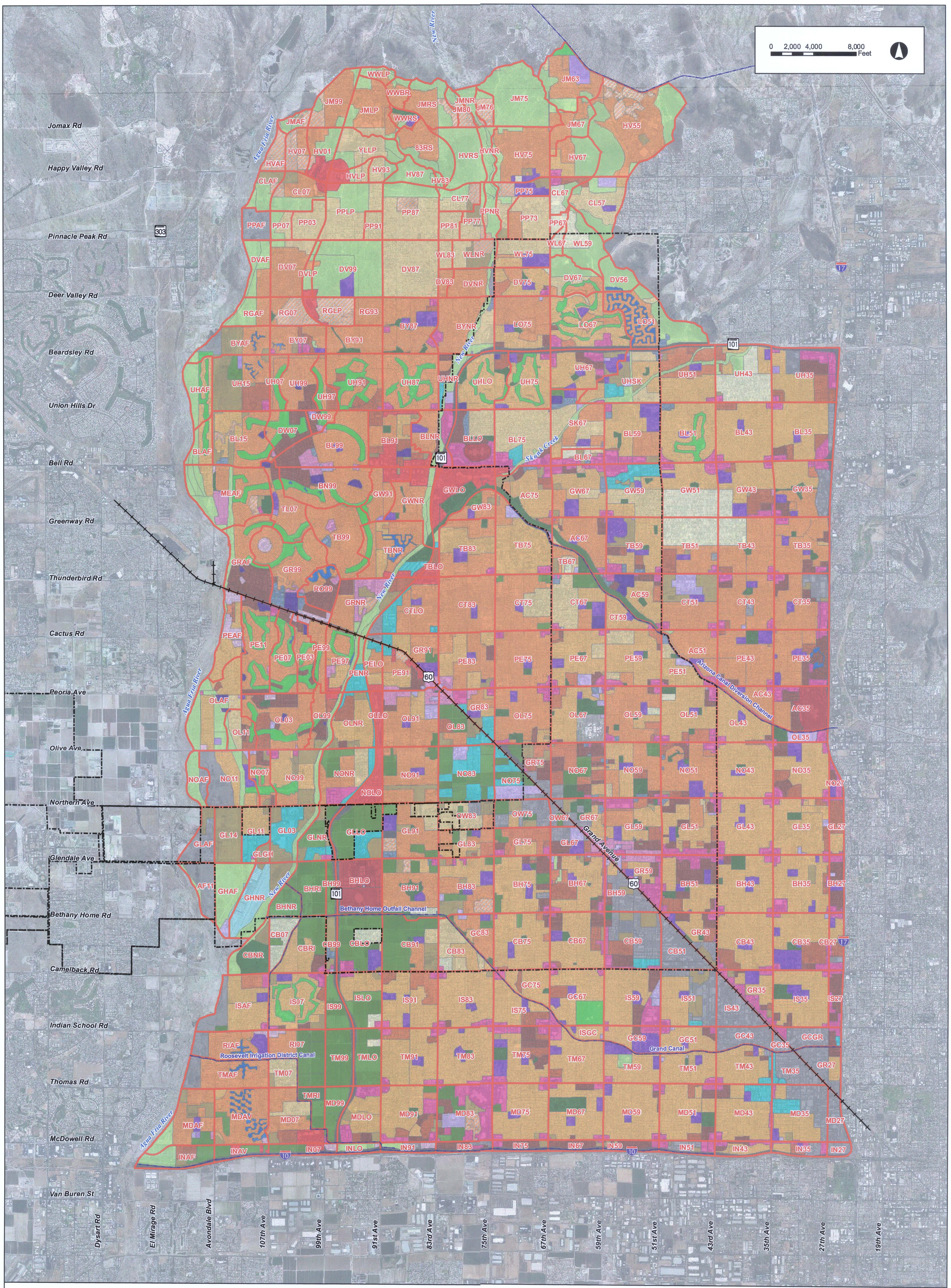
SHEET 04 OF 04
DRAWING NAME: EXHIBIT_03_SUBBASIN DELINEATION_MAP.MXD
PROJECT NO.: 091910009

GLENDALE AREA STORMWATER MANAGEMENT PLAN
EXHIBIT 3. SUBBASIN DELINEATION MAP

SCALE(H): 1"= 2000'
SCALE(V): NONE
DESIGNED BY: MAF
DRAWN BY: JAG
CHECKED BY: AOM
DATE: APRIL, 2010

Kimley-Horn and Associates, Inc.
© 2010 KIMLEY-HORN AND ASSOCIATES, INC.
Engineering, Planning and Environmental Consultants
7878 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

REVISION		02/11	



Legend

- Glendale City Limits
- Railroad
- Canal/Channel
- Subbasin Boundary

Existing Land Use

- Passive Open Space
- Golf Courses
- Agriculture
- Active Open Space
- Vacant
- Community Commercial
- Neighborhood Commercial (mixed use)
- General Commercial
- Regional Commercial
- Super-Regional Commercial
- Estate Residential
- Large Lot Residential
- Small Lot Residential
- Medium Lot Residential
- Medium High Density Residential
- High Density Residential
- Very High Density Residential
- Business Park
- Industrial
- Airport
- Office General
- Partially Developed (Vacant)
- Public Facilities (comm centers, libraries, etc)
- Public Facilities (sub-stations)
- Transportation
- Educational (Schools)
- Institutional
- Water

SHEET 01 OF 01

PROJECT NO. 091910009

DRAWING NAME EXHIBIT_06_PRE_AND_POST_DEVELOPED_AREAS_MAP.MXD

GLENDALE AREA STORMWATER MANAGEMENT PLAN EXHIBIT 4. EXISTING CONDITIONS LAND USE MAP

SCALE(H): 1"= 4000'
SCALE(V): NONE

DESIGNED BY: MAF
DRAWN BY: JAG
CHECKED BY: AOM

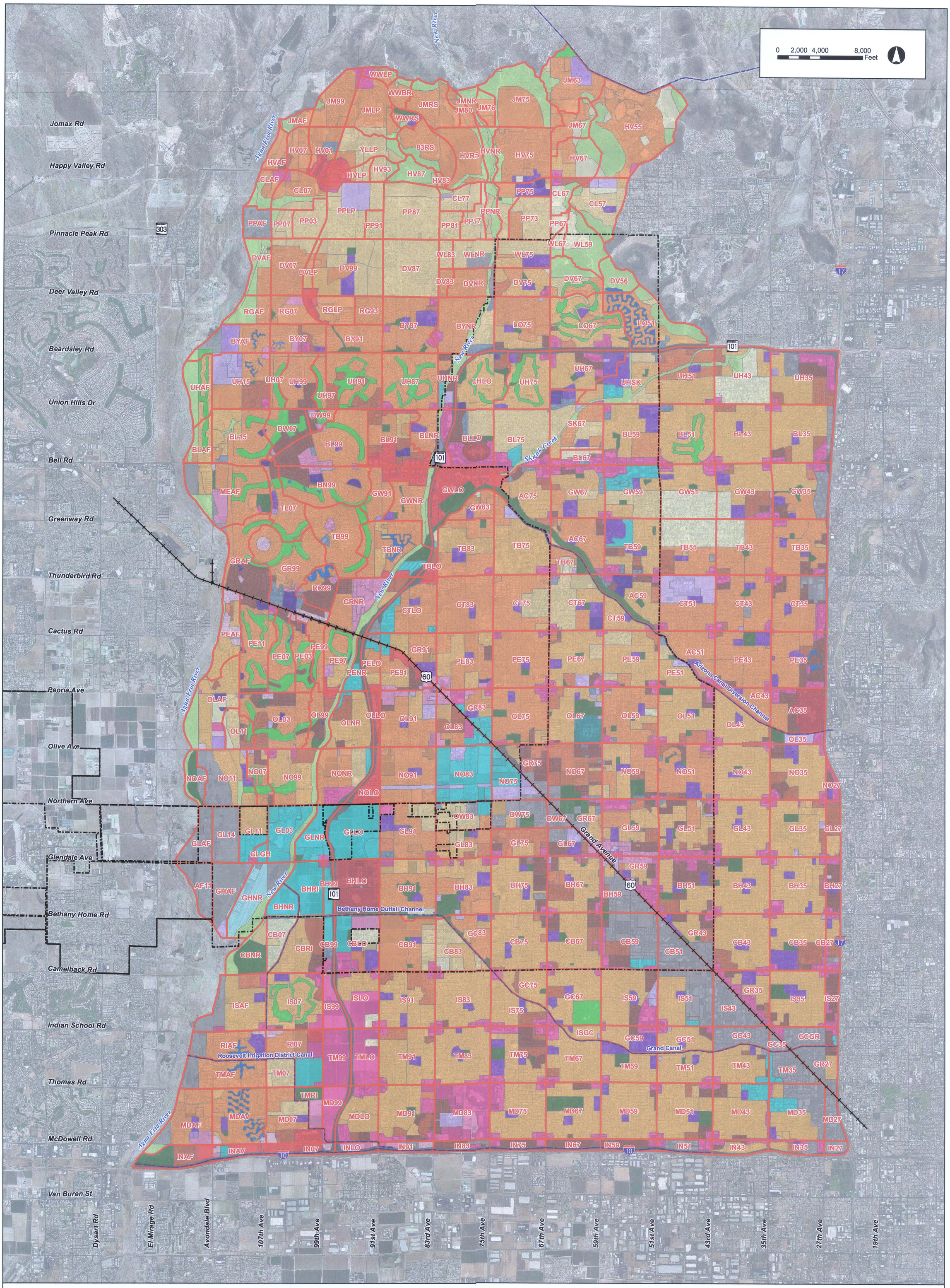
DATE: APRIL, 2010

Kimley-Horn and Associates, Inc.

© 2010 KIMLEY-HORN AND ASSOCIATES, INC.

Engineering, Planning and Environmental Consultants

7878 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500



Legend

- Glendale City Limits
- Railroad
- Canal/Channel
- Subbasin Boundary

Future Land Use

- Passive Open Space
- Golf Courses
- Active Open Space
- Community Commercial
- Neighborhood Commercial (mixed use)
- General Commercial
- Regional Commercial
- Super-Regional Commercial
- Estate Residential
- Large Lot Residential
- Small Lot Residential
- Medium Lot Residential
- Medium High Density Residential
- High Density Residential
- Very High Density Residential
- Business Park
- Industrial
- Airport
- Office General
- Partially Developed (Vacant)
- Public Facilities (comm centers, libraries, etc)
- Public Facilities (sub-stations)
- Transportation
- Educational (Universities)
- Educational (Schools)
- Institutional
- Water

SHEET 01 OF 01

DRAWING NAME: EXHIBIT_06_PRE_AND_POST_DEVELOPED_AREAS_MAP.MXD

PROJECT NO. 09191009

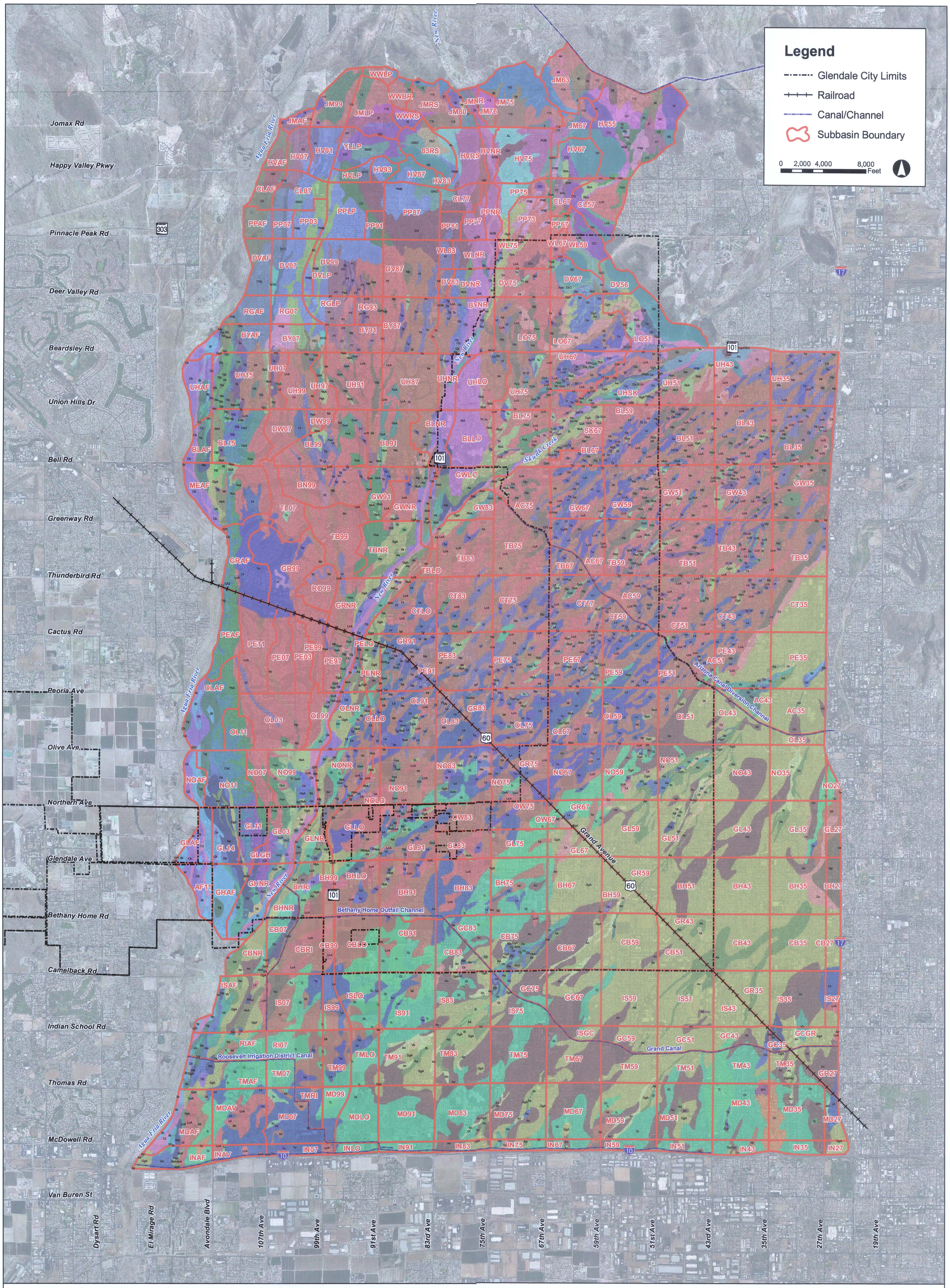
GLENDALE AREA STORMWATER MANAGEMENT PLAN
EXHIBIT 5. FUTURE CONDITIONS LAND USE MAP

SCALE(H): 1"= 4000'
SCALE(V): NONE

DESIGNED BY: MAF
DRAWN BY: JAG
CHECKED BY: AOM

DATE: APRIL, 2010

Kimley-Horn and Associates, Inc.
© 2010 KIMLEY-HORN AND ASSOCIATES, INC.
Engineering, Planning and Environmental Consultants
7878 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500



SCS Soils

- 10, Brios-Carrizo complex
- 100, Quilotosa-Vaiva-Rock outcrop complex
- 101, Rillito loam
- 110, Suncity-Cipriano complex
- 112, Tremant gravelly sandy loams
- 115, Tremant-Antho complex
- 118, Tremant-Rillito complex
- 13, Carefree-Beardsley complex
- 18, Cheriono-Rock outcrop complex
- 21, Cipriano very gravelly loam
- 3, Antho-Carrizo-Maripo complex
- 44, Ebon very gravelly loam
- 53, Gadsden clay
- 55, Gilman loams
- 68, Gunsight-Cipriano complex
- 70, Gunsight-Rillito complex
- 75, Mohall loam
- 98, Pinamt-Tremant complex
- AGB, Antho-Carrizo complex
- AL, Antho association
- Aa, Agualt loam
- AbA, Anthosandy loam
- AbB, Antho sandy loam
- AdA, Antho gravelly sandy loam
- AdB, Antho gravelly sandy loam
- Ae, Antho-Brios sandy loams
- AfA, Antho-Carrizo complex
- An, Avonda clay loam
- Ao, Avondale clay loam
- BE, Beardsley loam
- BPI, Borrow pit
- Br, Brios loamy sand
- Bs, Brios sandy loam
- Bt, Brios loam
- CA2, Calciorthids and Torriorthents, eroded
- CF, Carrizo and Brios soils
- CO, Cheriono-Rock outcrop complex
- CV, Coolidge-Laveen association
- Cb, Carrizo gravelly sandy loam
- Cp, Coolidge sandy loam
- CrB, Coolidge gravelly sandy loam
- EbD, Ebon gravelly loam
- Es, Estrella loam
- GM, Gilman-Antho association
- GN, Gilman-Laveen association
- GPI, Gravel pit
- GWD, Gunsight-Pinal complex
- GYD, Gunsight-Rillito complex
- Ge, Gilman fine sandy loam
- GgA, Gilman loan
- Gr, Glenbar loam
- Gt, Glenbar clay loam
- Gv, Glenbar clay
- GxA, Gunsight-Rillito complex
- GxB, Gunsight-Rillito complex
- Lb, Laveen sandy loam
- LcA, Laveen loam
- LcB, Laveen loam
- Le, Laveen clay loam
- MTB, Mohall-Tremant complex
- Ma, Maripo sandy loam
- Mo, Mohall sandy loam
- Mp, Mohall loam
- Mr, Mohall clay loam
- Ms, Mohall clay
- PRB, Perryville-Rillito complex
- PT, Pinal gravelly loam
- PWB, Pinal-Suncity complex
- Pa, Perryville sandy loam
- PeA, Perryville gravelly loam
- PeB, Perryville gravelly loam
- PsA, Pinal loam
- PsB, Pinal loam
- RS, Rock outcrop-Cherioni complex
- RaA, Rillito sandy loam
- RaB, Rillito sandy loam
- RbA, Rillito loam
- RbB, Rillito loam
- RpE, Rillito-Perryville complex
- TD, Torripsamments and Torrifluvents frequently flooded
- TPB, Tremant complex
- TSC, Tremant-Rillito complex
- Ta, Toltec loam
- Tc, Torriorthents
- Te, Tremant loam
- TfA, Tremant gravelly loam
- TfB, Tremant gravelly loam
- Tg, Tremant clay loam
- Th, Tremant gravelly clay loam
- TrA, Tremant-Rillito complex
- TrB, Tremant-Rillito complex
- Tt, Trix clay loam
- Tu, Tucson loam
- Tw, Tucson clay loam
- Va, Valencia sandy loam
- Ve, Vecont loam
- Vf, Vecont clay
- Vg, Vint loamy fine sand
- Vh, Vint fine sandy loam
- Vk, Vint loam
- W, Lakes, ponds, reservoirs - perennial

SHEET 01 OF 01

DRAWING NAME: EXHIBIT_06_PRE_AND_POST_DEVELOPED_AREAS_MAP.MXD

PROJECT NO. 09191009

GLENDALE AREA STORMWATER MANAGEMENT PLAN
EXHIBIT 6. SOILS MAP

SCALE(H): 1"= 4000'
SCALE(V): NONE

DESIGNED BY: MAF
DRAWN BY: JAG
CHECKED BY: AOM

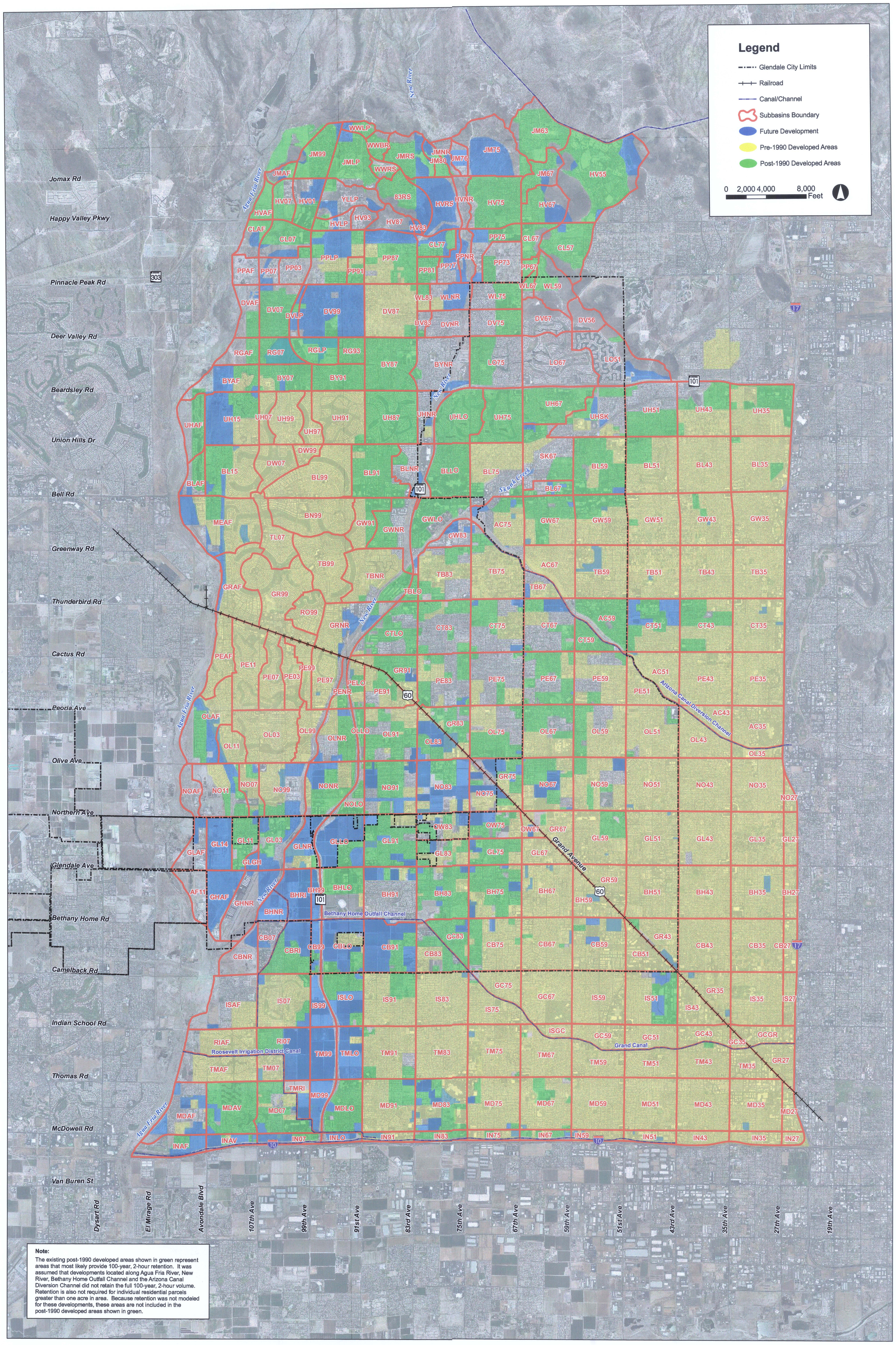
DATE: APRIL, 2010

Kimley-Horn and Associates, Inc.

© 2010 KIMLEY-HORN AND ASSOCIATES, INC.

Engineering, Planning and Environmental Consultants

7878 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500



Note:

The existing post-1990 developed areas shown in green represent areas that most likely provide 100-year, 2-hour retention. It was assumed that developments located along Agua Fria River, New River, Bethany Home Outfall Channel and the Arizona Canal Diversion Channel did not retain the full 100-year, 2-hour volume. Retention is also not required for individual residential parcels greater than one acre in area. Because retention was not modeled for these developments, these areas are not included in the post-1990 developed areas shown in green.

SHEET 01 OF 01

PROJECT NO. 091910009

DRAWING NAME EXHIBIT_06_PRE_AND_POST_DEVELOPED_AREAS_MAP.MXD

GLENDALE AREA STORMWATER MANAGEMENT PLAN
EXHIBIT 7. PRE- AND POST-1990 DEVELOPED AREAS MAP

SCALE(H): 1"= 4000'
SCALE(V): NONE

DESIGNED BY: MAF
DRAWN BY: JAG
CHECKED BY: AOM

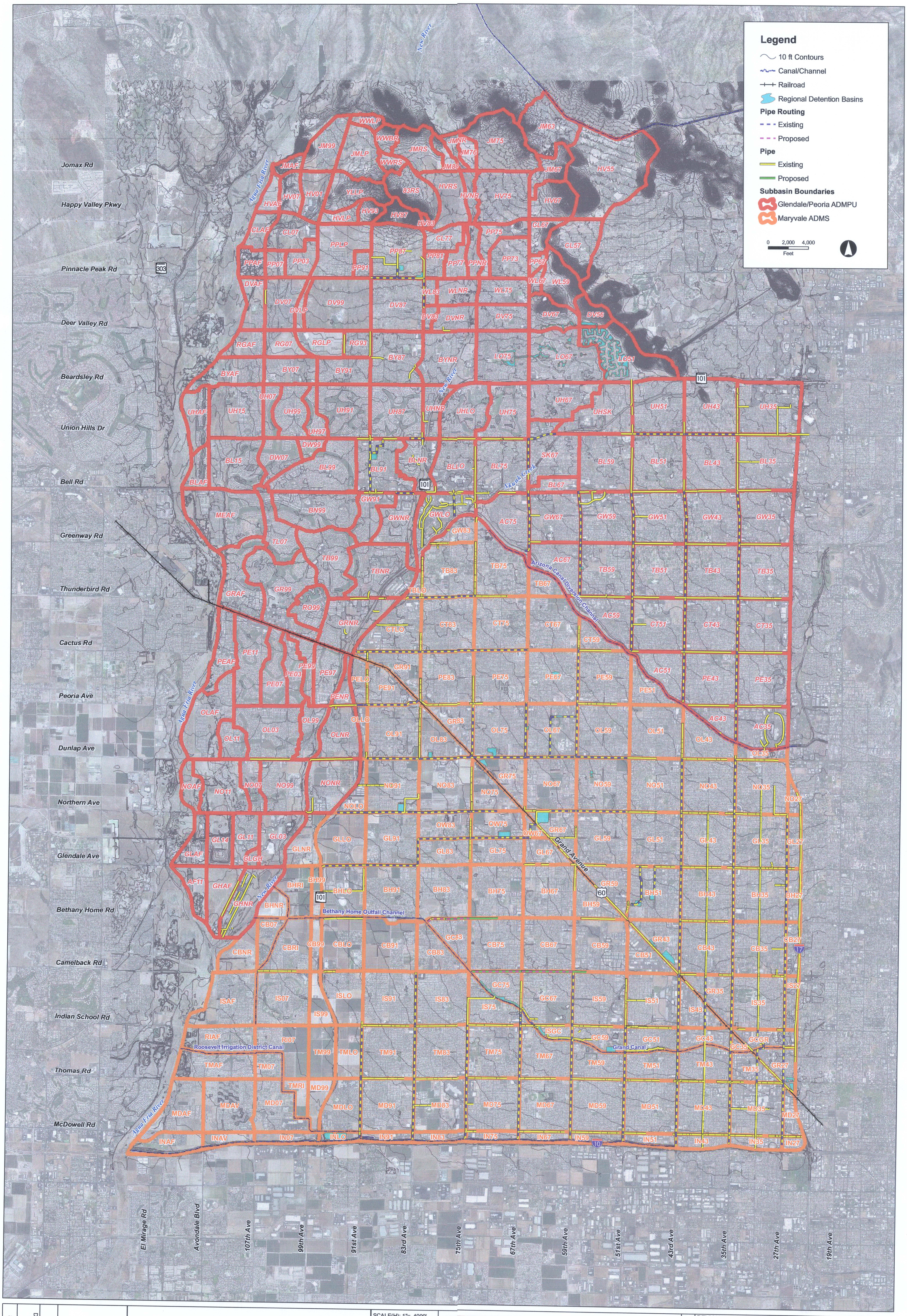
DATE: APRIL, 2010

Kimley-Horn and Associates, Inc.

© 2010 KIMLEY-HORN AND ASSOCIATES, INC.

Engineering, Planning and Environmental Consultants

7878 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500



SHEET 1 OF 1	PROJECT NO. 091910009		GLENDALE AREA STORMWATER MANAGEMENT PLAN EXHIBIT 8. PIPE ROUTING MAP
	DRAWING NAME EXHIBIT_08_PIPE_ROUTING.MXD		

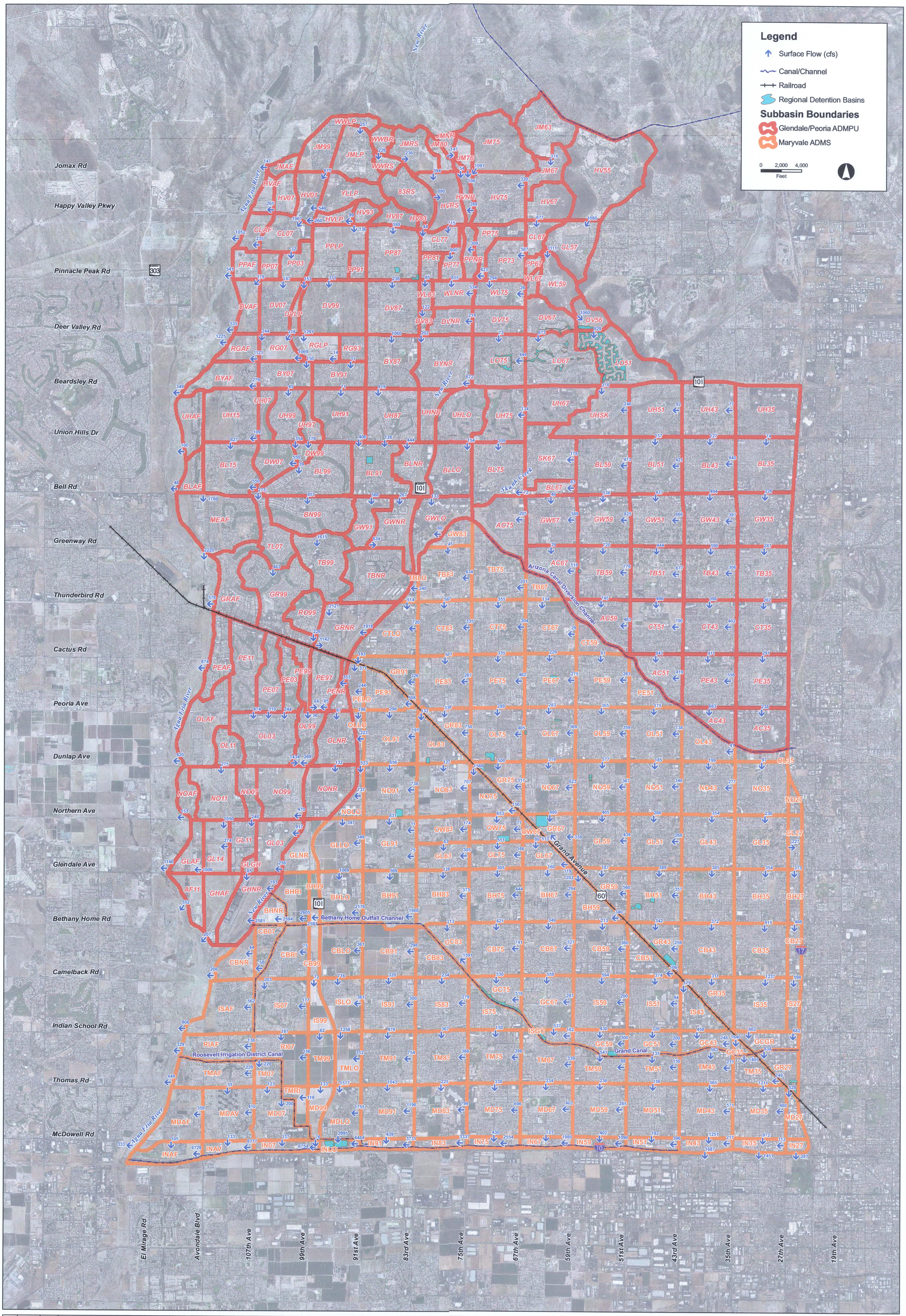
SCALE(H): 1"= 4000'
SCALE(V): NONE
DESIGNED BY: MAF
DRAWN BY: JAG
CHECKED BY: AOM
DATE: SEPT, 2010

Kimley-Horn and Associates, Inc.

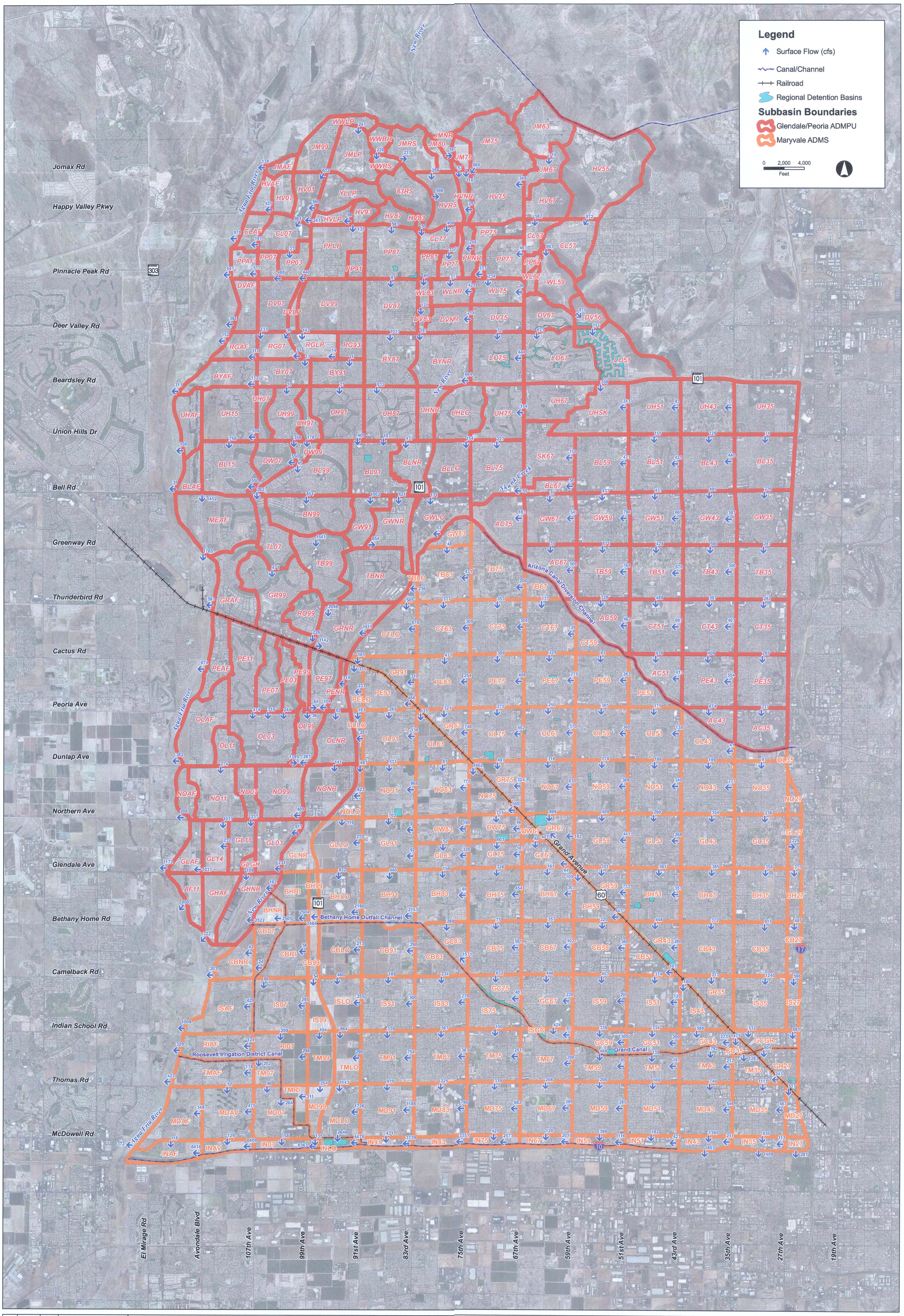
© 2010 KIMLEY-HORN AND ASSOCIATES, INC.

Engineering, Planning and Environmental Consultants
7878 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

REVISION			02/11	



SHEET 1 OF 1	DRAWING NAME EXHIBIT_09_HYDROLOGY 100_YEAR.MXD	PROJECT NO. 091910009		GLENDALE AREA STORMWATER MANAGEMENT PLAN EXHIBIT 9. HYDROLOGY RESULTS FOR THE EXISTING CONDITIONS 100-YEAR STORM EVENT	SCALE(H): 1"= 4000' SCALE(V): NONE DESIGNED BY: MAF DRAWN BY: JAG CHECKED BY: AOM DATE: OCTOBER, 2010	Kimley-Horn and Associates, Inc. © 2010 KIMLEY-HORN AND ASSOCIATES, INC. Engineering, Planning and Environmental Consultants 7878 North 16th Street, Suite 300 Phoenix, Arizona 85020 (602) 944-5500	REVISION 02/11



GLENDALE AREA
STORMWATER MANAGEMENT PLAN
EXHIBIT 10. HYDROLOGY RESULTS FOR THE
FUTURE CONDITIONS 100-YEAR STORM EVENT

SCALE(H): 1"= 4000'
SCALE(V): NONE

DESIGNED BY: MAF
DRAWN BY: JAG
CHECKED BY: AOM

DATE: SEPT, 2010

Kimley-Horn and Associates, Inc.

© 2010 KIMLEY-HORN AND ASSOCIATES, INC.

Engineering, Planning and Environmental Consultants

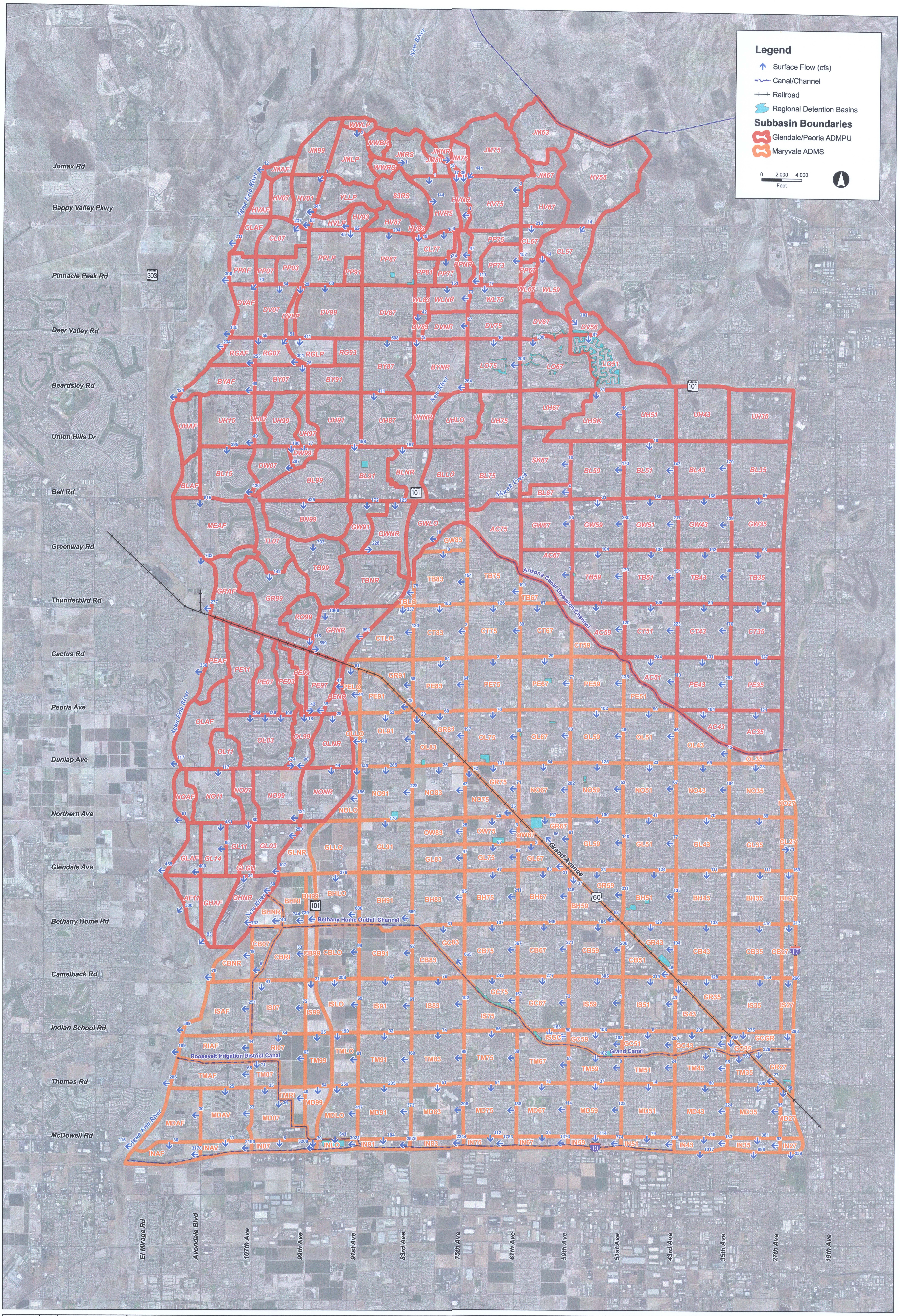
7878 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

REVISION		02/11	

PROJECT NO. 091910009

DRAWING NAME EXHIBIT_10_HYDROLOGY_FUTURE_100_YEAR.MXD

SHEET 1 OF 1



PROJECT NO. 091910009	DRAWING NAME EXHIBIT_10_HYDROLOGY 11_YEAR.MXD	SHEET 1 OF 1

GLENDALE AREA
STORMWATER MANAGEMENT PLAN
EXHIBIT 11. HYDROLOGY RESULTS
FOR THE 10-YEAR STORM EVENT

SCALE(H): 1"= 4000'
SCALE(V): NONE
DESIGNED BY: MAF
DRAWN BY: JAG
CHECKED BY: AOM
DATE: SEPT, 2010

Kimley-Horn and Associates, Inc.

© 2010 KIMLEY-HORN AND ASSOCIATES, INC.

Engineering, Planning and Environmental Consultants
7878 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

REVISION		02/11	