REIMAGINING THE

Cadillac Desert

THURSDAY, SEPT. 15, 2016

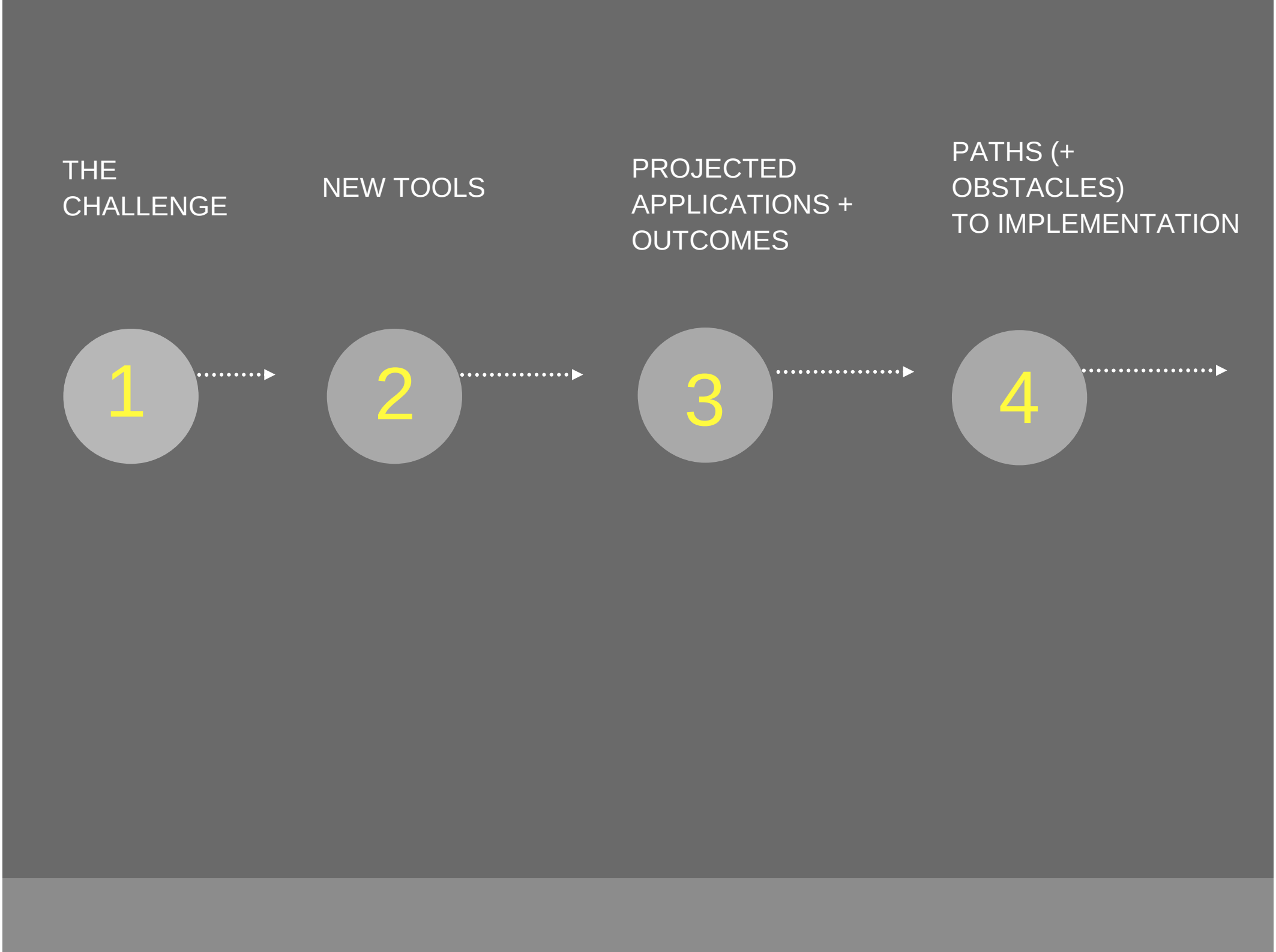
BEST BEST & KRIEGER LLP

Divining LA: New Decision Support Tools for Climate Adaptation in Drylands

Hadley Arnold, Arid Lands Institute

aridlands.org

#BBKCadDesert


THE CHALLENGE
NEW TOOLS
PROJECTED APPLICATIONS + OUTCOMES
PATHS (+ OBSTACLES) TO IMPLEMENTATION
1
2
3
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1

THE CHALLENGE:
TO MAXIMIZE LOCALIZATION POTENTIALS

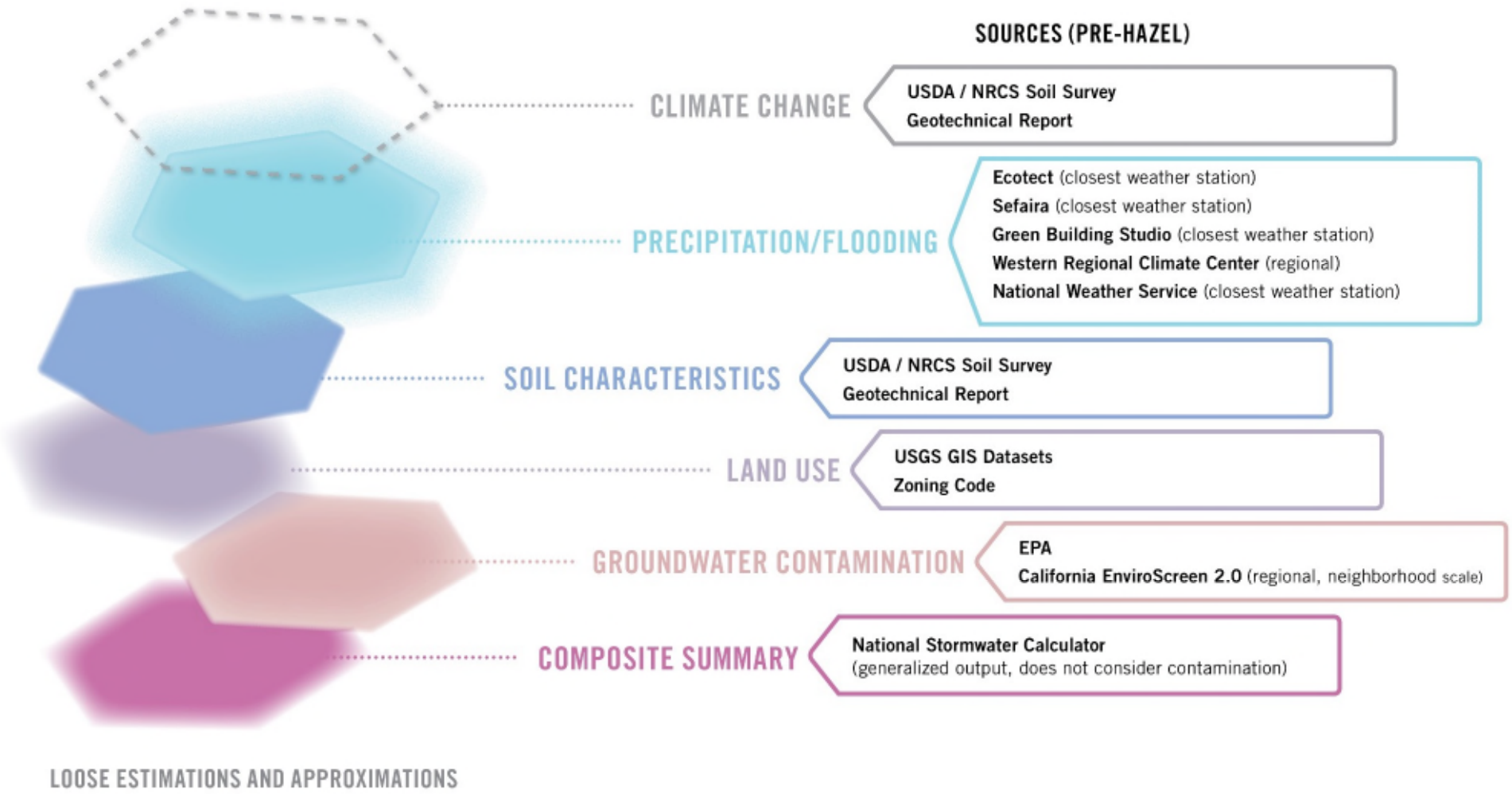
RECOGNIZED OPPORTUNITY: STORMWATER TO INCREASE LOCAL SUPPLY; REDUCE CARBON EMISSIONS.

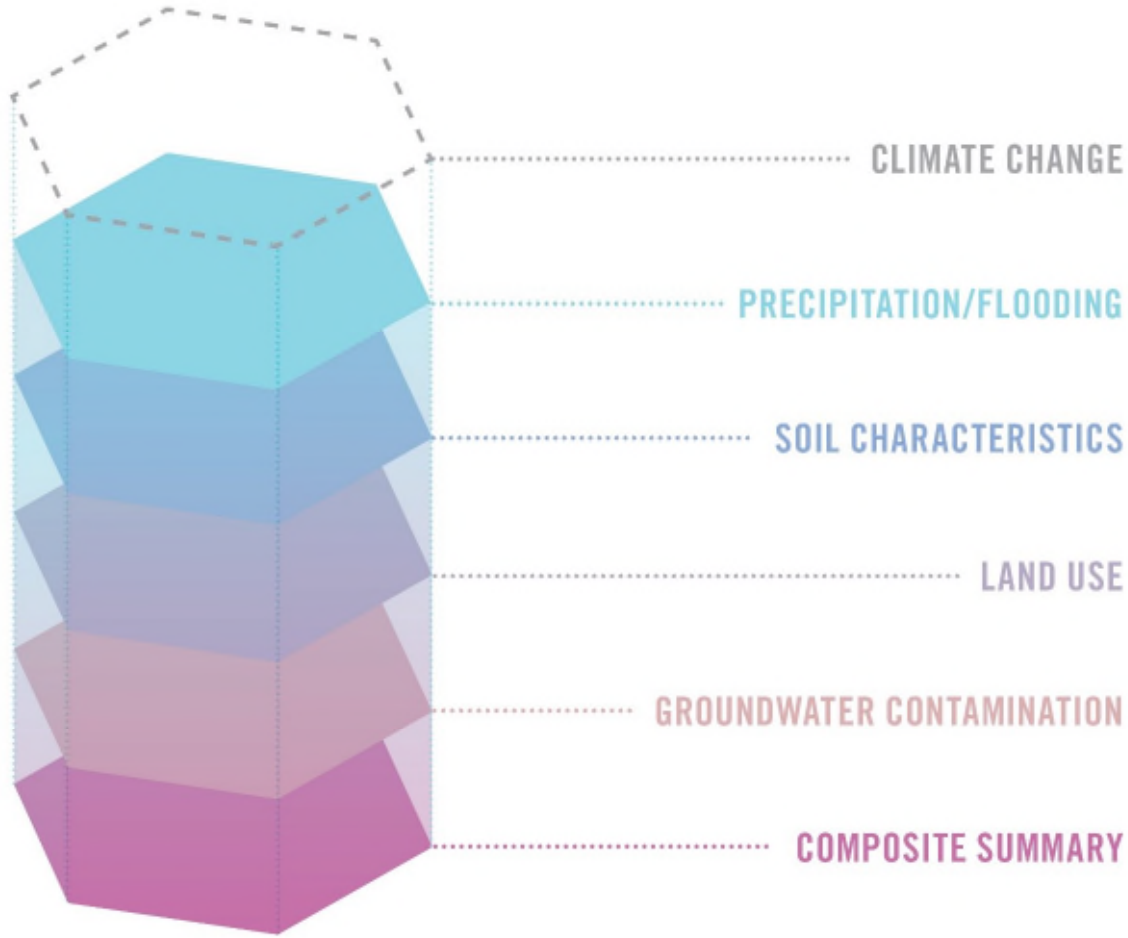
OBSTACLE: HOW TO PRIORITIZE INVESTMENT AND OPTIMIZE BASIN-WIDE FUNCTION?

Relevant water data is insufficiently rich, integrated, and analyzable to inform effective site-specific decision making.

2

HAZEL:
NEW DECISION-SUPPORT TOOL FOR WATER-SMART DESIGN


SOURCES (PRE-HAZEL)
CLIMATE CHANGE
USDA / NRCS Soil Survey
Geotechnical Report
PRECIPITATION/FLOODING
Ecotect (closest weather station)
Sefaira (closest weather station)
Green Building Studio (closest weather station)
Western Regional Climate Center (regional)
National Weather Service (closest weather station)
SOIL CHARACTERISTICS
USDA / NRCS Soil Survey
Geotechnical Report
LAND USE
USGS GIS Datasets
Zoning Code
GROUNDWATER CONTAMINATION
EPA
California EnviroScreen 2.0 (regional, neighborhood scale)
COMPOSITE SUMMARY
National Stormwater Calculator
(generalized output, does not consider contamination)
LOOSE ESTIMATIONS AND APPROXIMATIONS



HAZEL: COHESIVE AND PRECISE

Hazel 1.0

Phase I: Probabilistic Overlay Approach

Geospatial Model
This model is both a computation device and visualization tool. We designed it to aid in the identification of the most opportunistic areas for capturing stormwater and safely infiltrating it to replenish groundwater supplies, a recognized priority for offsetting dependence on water imports. The model uses a multi-criteria decision-making approach to identify the most suitable areas for stormwater capture, detention, conveyance, and safe infiltration. Functionally, the model is composed of multiple components: a stormwater runoff model, an infiltration model, and a constraint model. Outputs from these components are combined to form a resultant infiltration suitability analysis and a subwatershed prioritization analysis.

Run Off Model

30-year Precipitation Normals

15m Remotely Sensed Impermeability Assessment

Infiltration Model

1915 + 1919 USDA Soil Survey for San Fernando Valley, LA Basin

2008 NRCS SSURGO Soil Survey [incomplete]

2012 CA Quaternary Surficial Geology

2003 CA Geologic Survey Soil Liquefaction

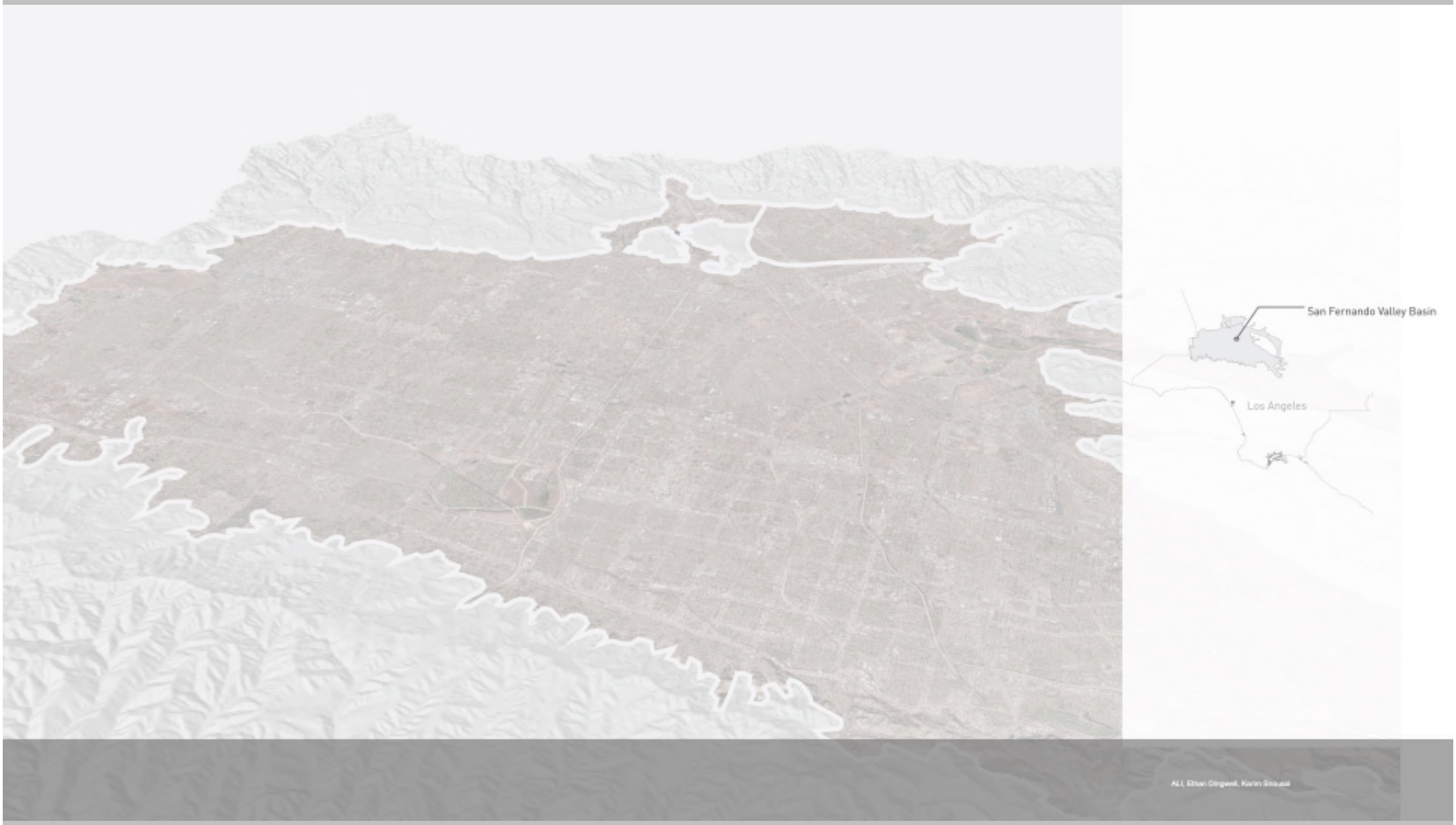
Constraint Fuzzy Logic Model

2007 EPA Superfund Plume Dataset

2012 EPA Toxic Release Database

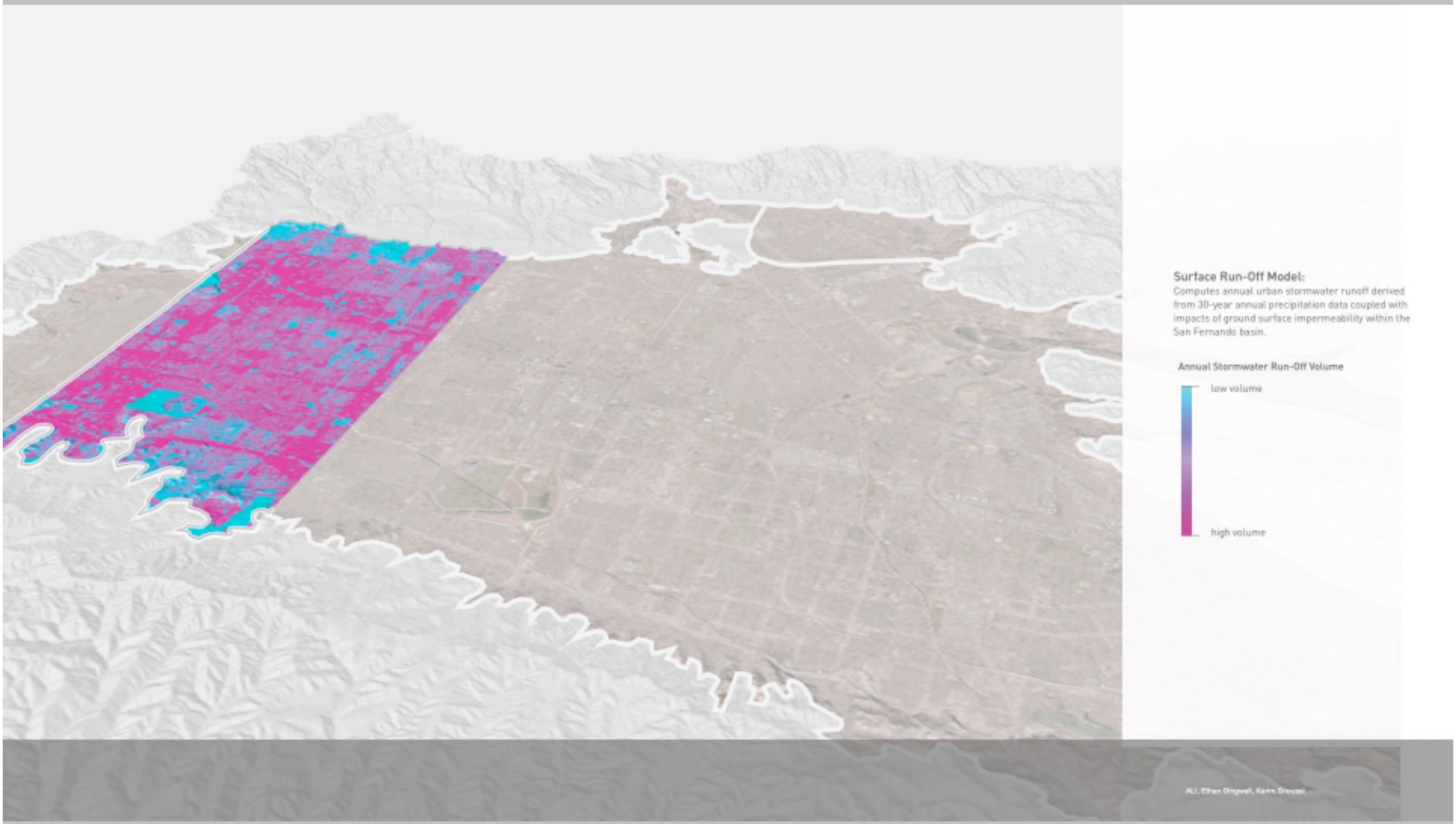
2013 CA Water Resources Control Board Geotracker Sites

Resultant Model

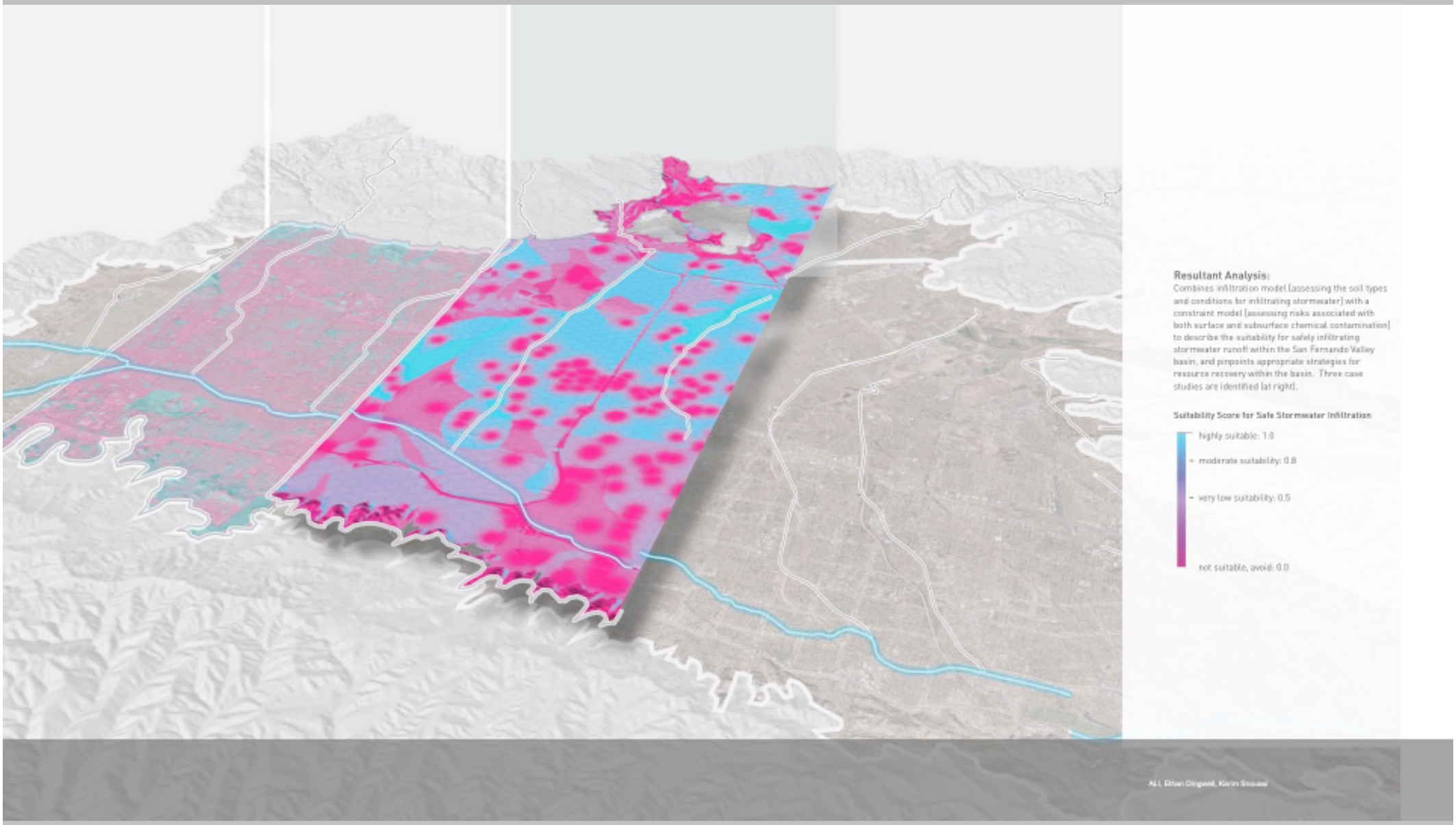


ALL Ethan Dingwell, Karim Sinoussi

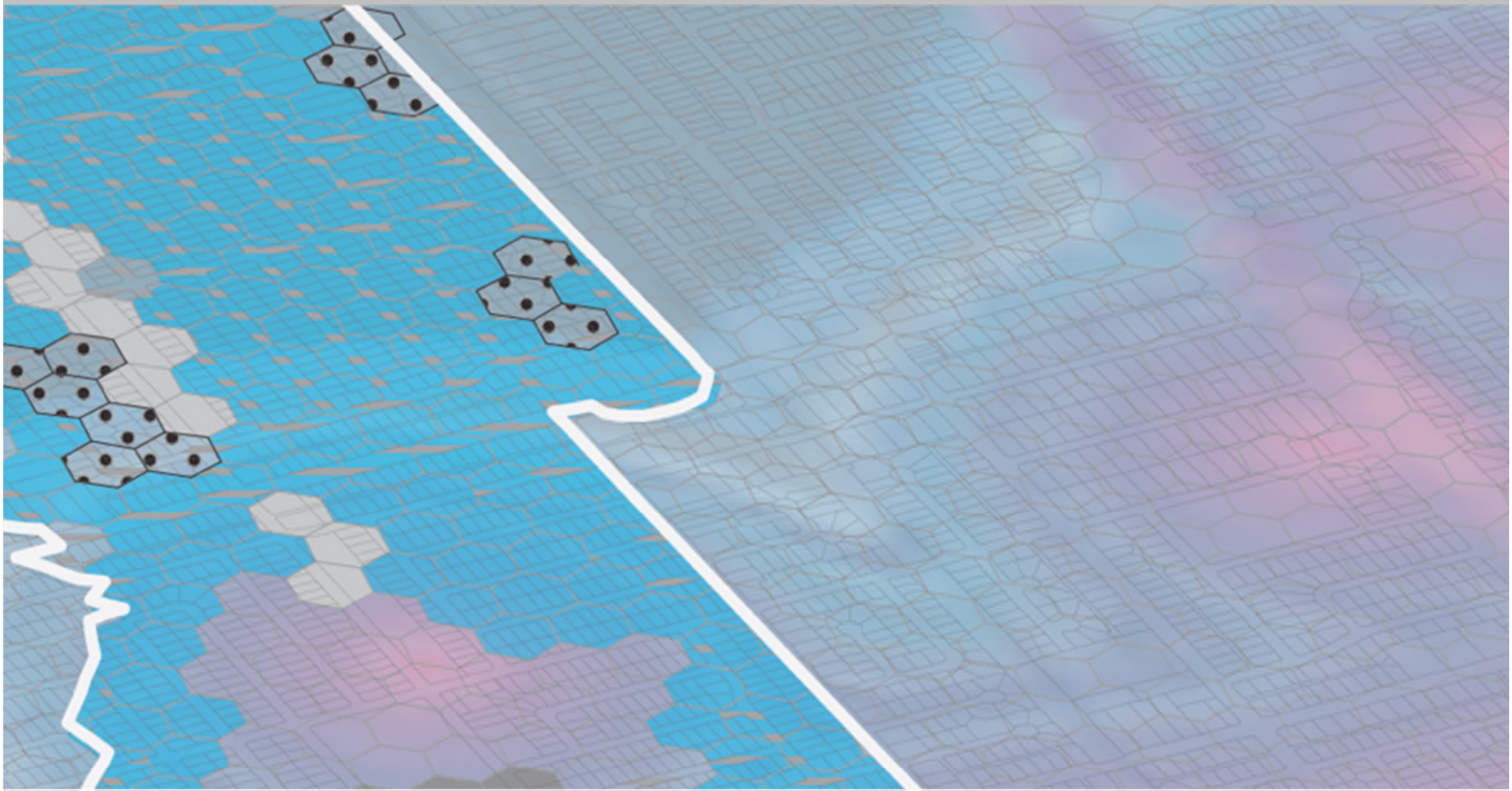
Surface Run-Off



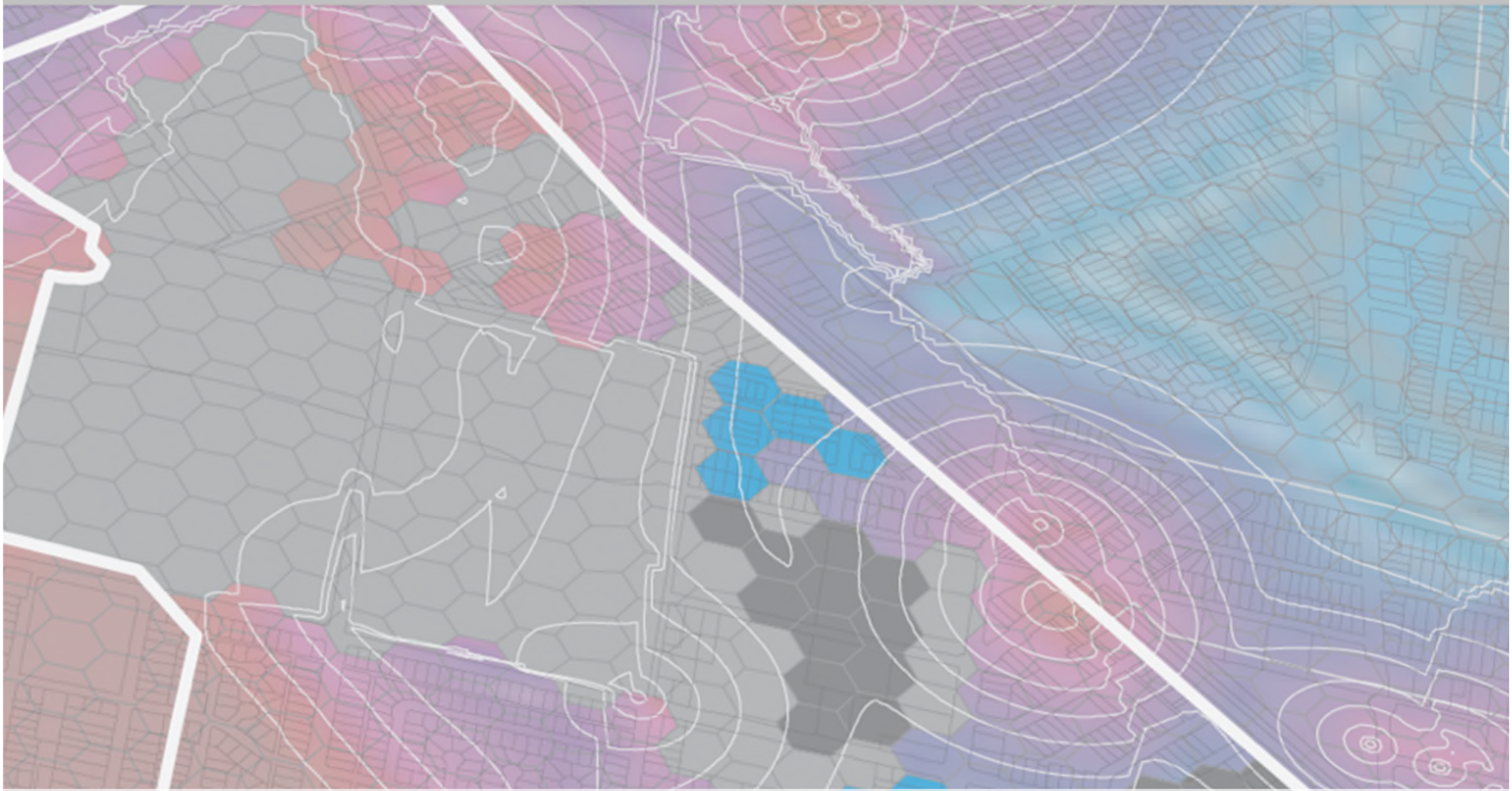
Infiltration Model



Prioritization

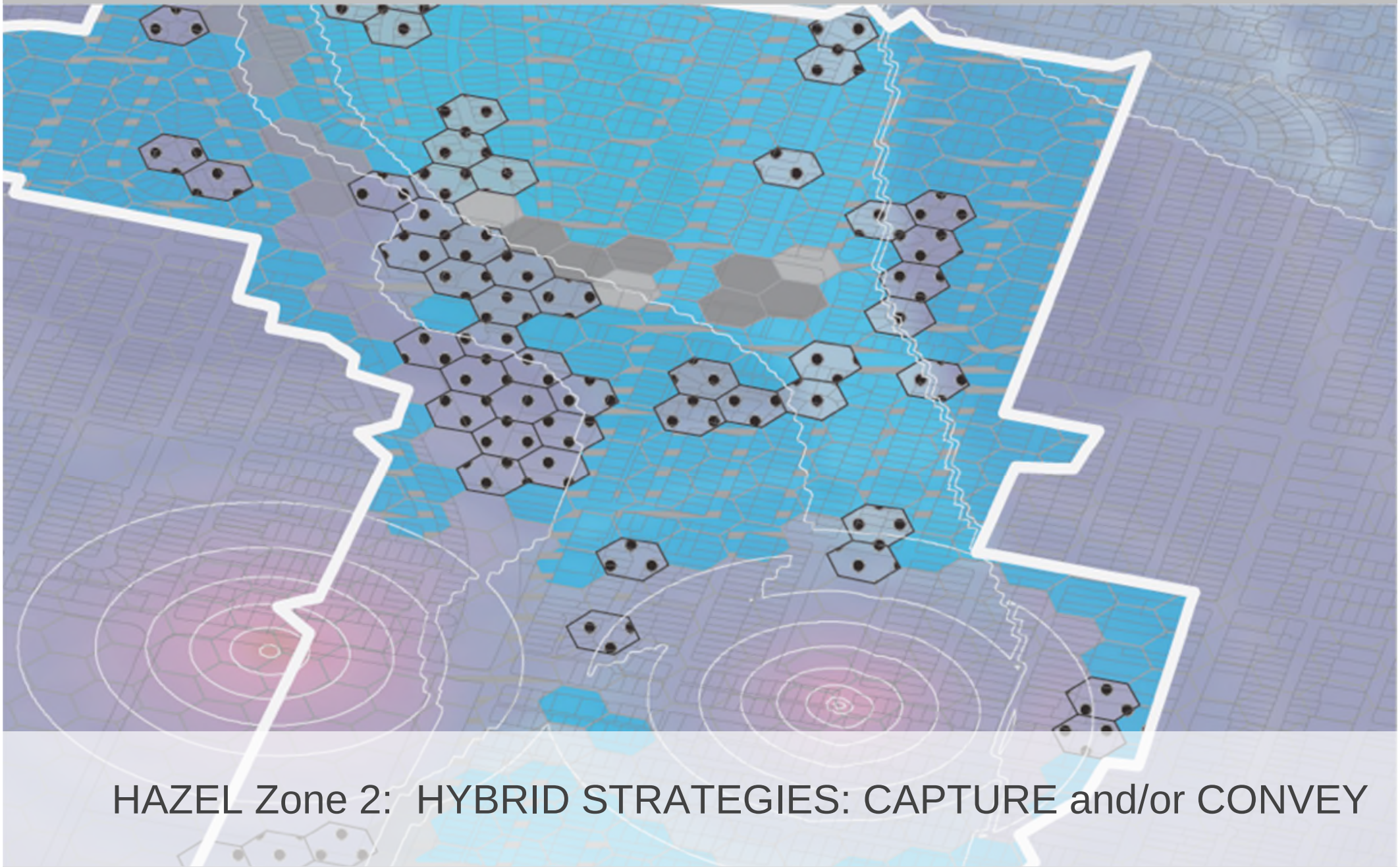


HAZEL Zone 1: INFILTRATE



HAZEL Zone 3: DO NOT INFILTRATE: CAPTURE and REUSE

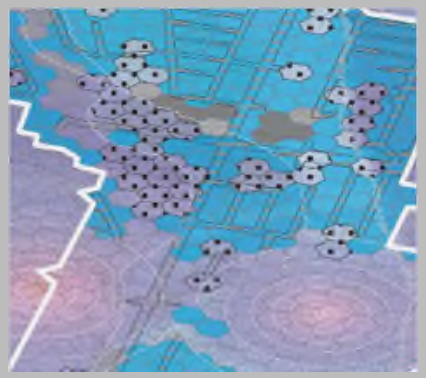
DRI: DRYLANDS RESILIENCE INITIATIVE



HAZEL Zone 2: HYBRID STRATEGIES: CAPTURE and/or CONVEY

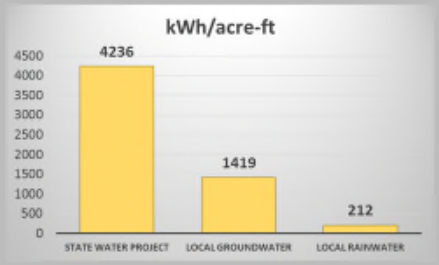
1. Suitability Analysis

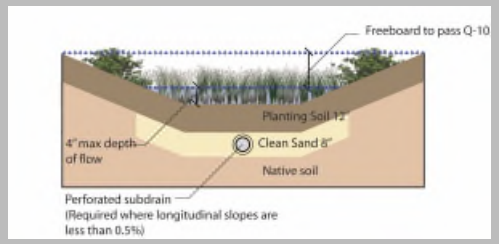
Infiltration Opportunity of
Hazel Zones



2. Performance Metrics

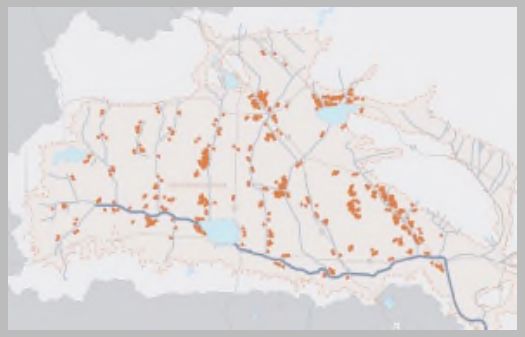
Ecosystem Services
Cost/Benefit





3. Right Sizing

System design and optioneering
Climate scenarios



4. Synthesis

Prioritization & Planning

Performance Metrics

Water generated (infiltrate or harvest)
gallons (or acre/feet)

Energy Saved
kWh

GHG Reduced
Tons of CO2e

Habitat created
Acres

Heat Reduction
Area affected and degree temp reduction by location

Economic Cost/Benefit
Dollars expended/saved

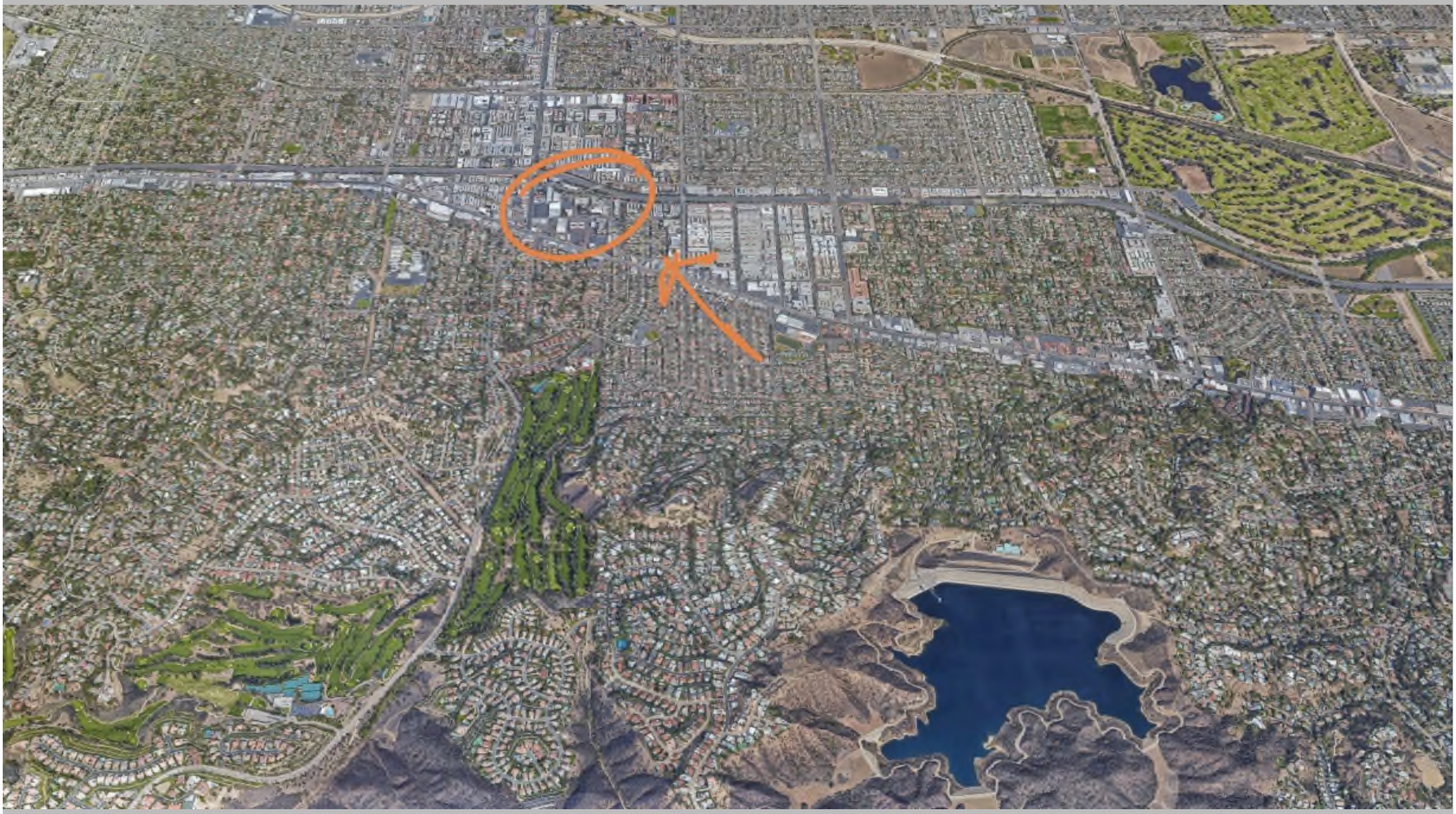
Pollutants Removed
Lbs sediment, nutrients, metals etc…/year

3

PROJECTED APPLICATIONS + OUTCOMES:

CASE STUDY by PERKINS + WILL

CASE STUDY SITE



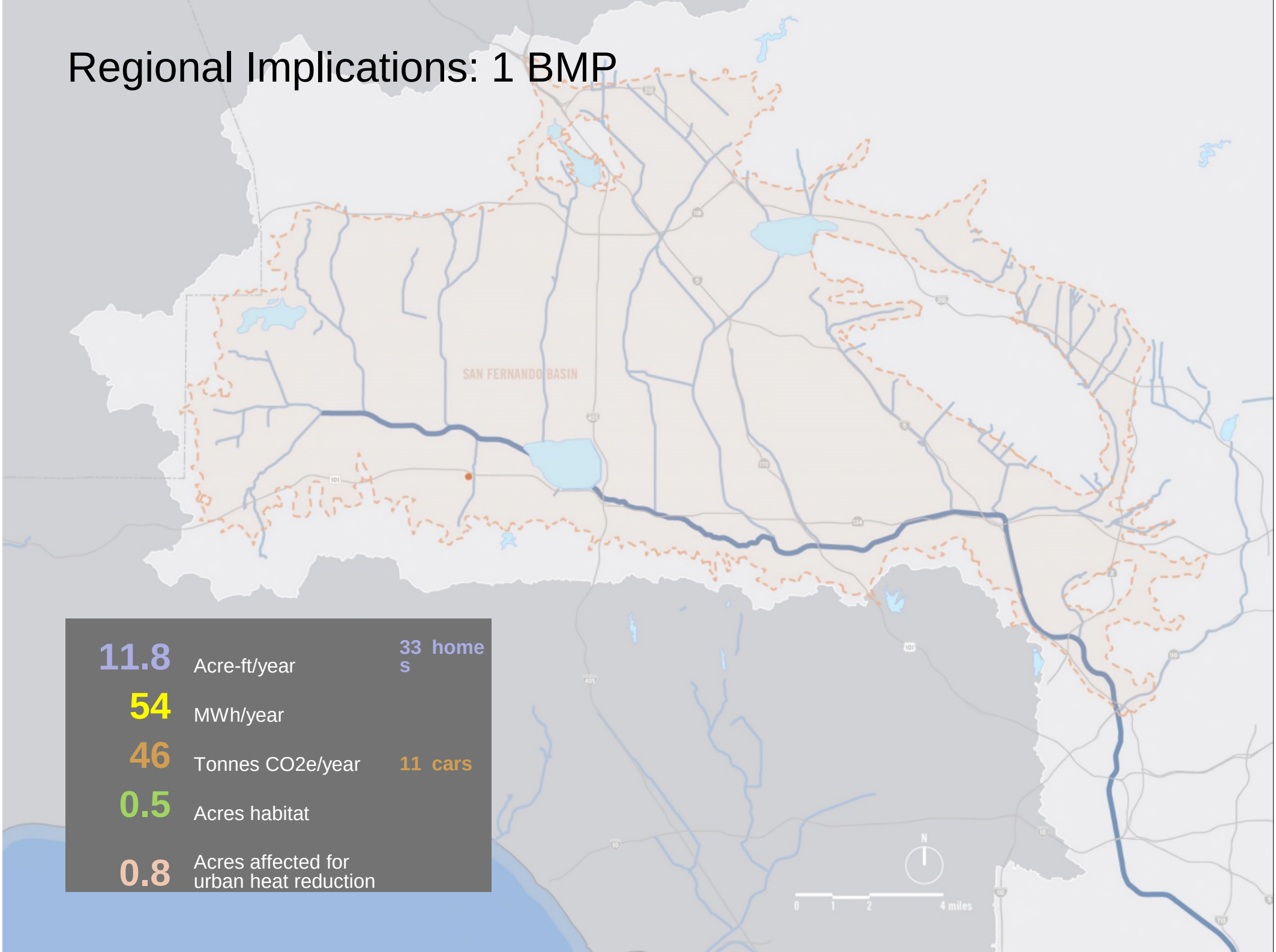
CASE STUDY SITE

HZ1: Infiltrate (Option A – Bioretention Basin)

11.8	Acre-ft/year	**33 homes**
54	MWh/year	
46	Tonnes CO2e/year	**11 cars**
0.5	Acres habitat	
0.8	Acres affected for urban heat reduction	

Value of Resources ~ $15,789/year

Regional Implications: 1 BMP



11.8	Acre-ft/year	33 homes
54	MWh/year	
46	Tonnes CO2e/year	11 cars
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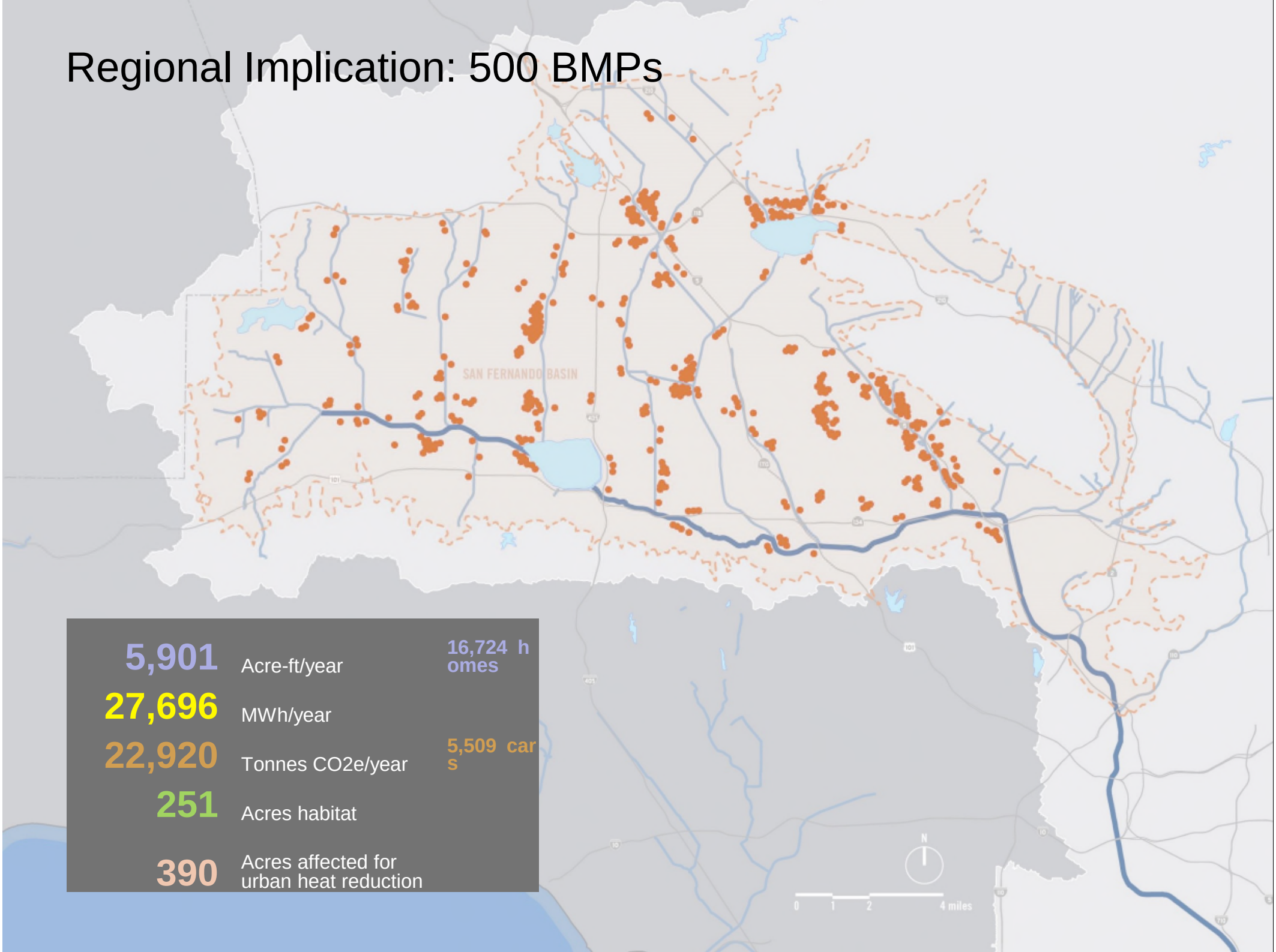
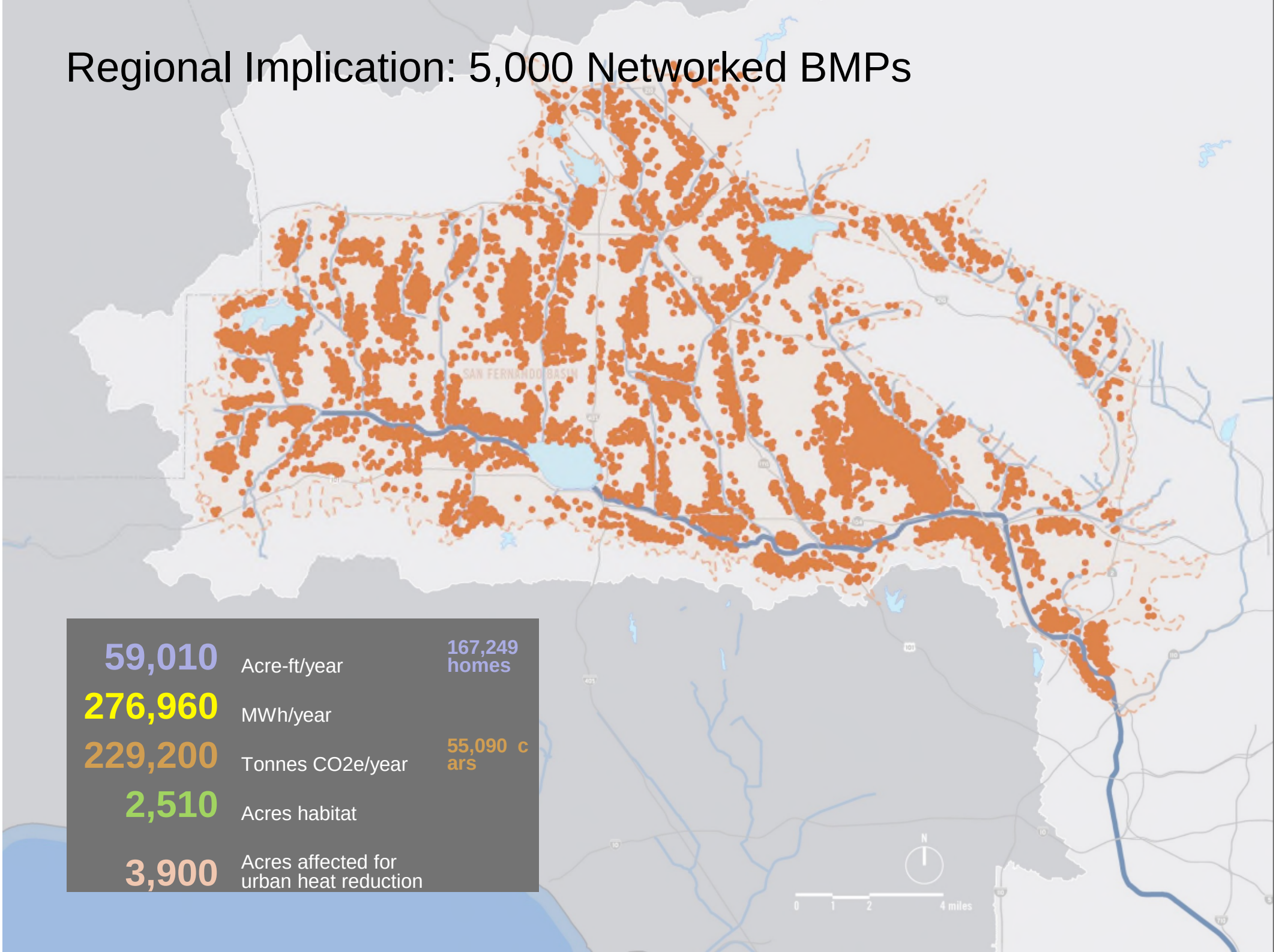
Regional Implication: 500 BMPs



5,901	Acre-ft/year	16,724 homes
27,696	MWh/year	
22,920	Tonnes CO2e/year	5,509 cars
251	Acres habitat	
390	Acres affected for urban heat reduction	

Regional Implication: 5,000 Networked BMPs

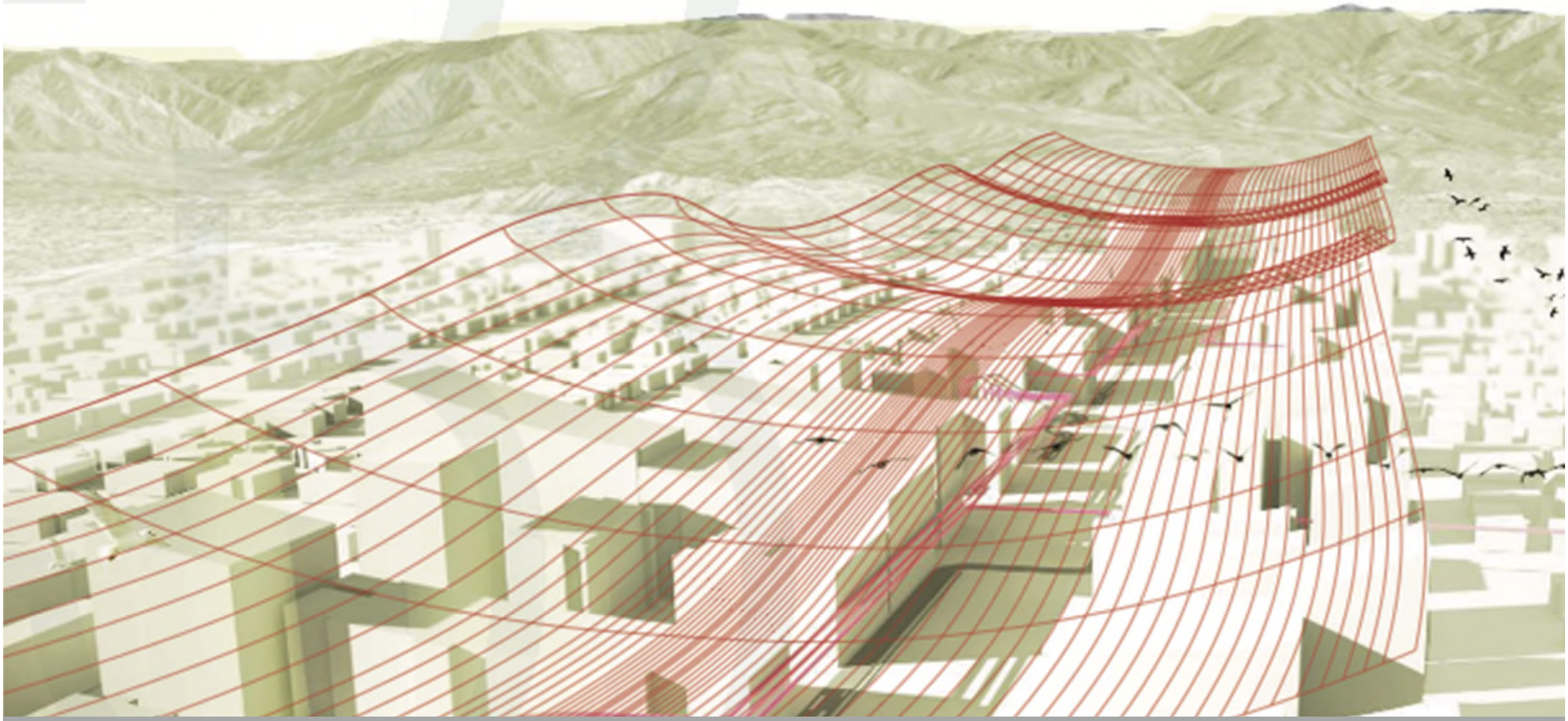


59,010	Acre-ft/year	167,249 homes
276,960	MWh/year	
229,200	Tonnes CO2e/year	55,090 cars
2,510	Acres habitat	
3,900	Acres affected for urban heat reduction	

4

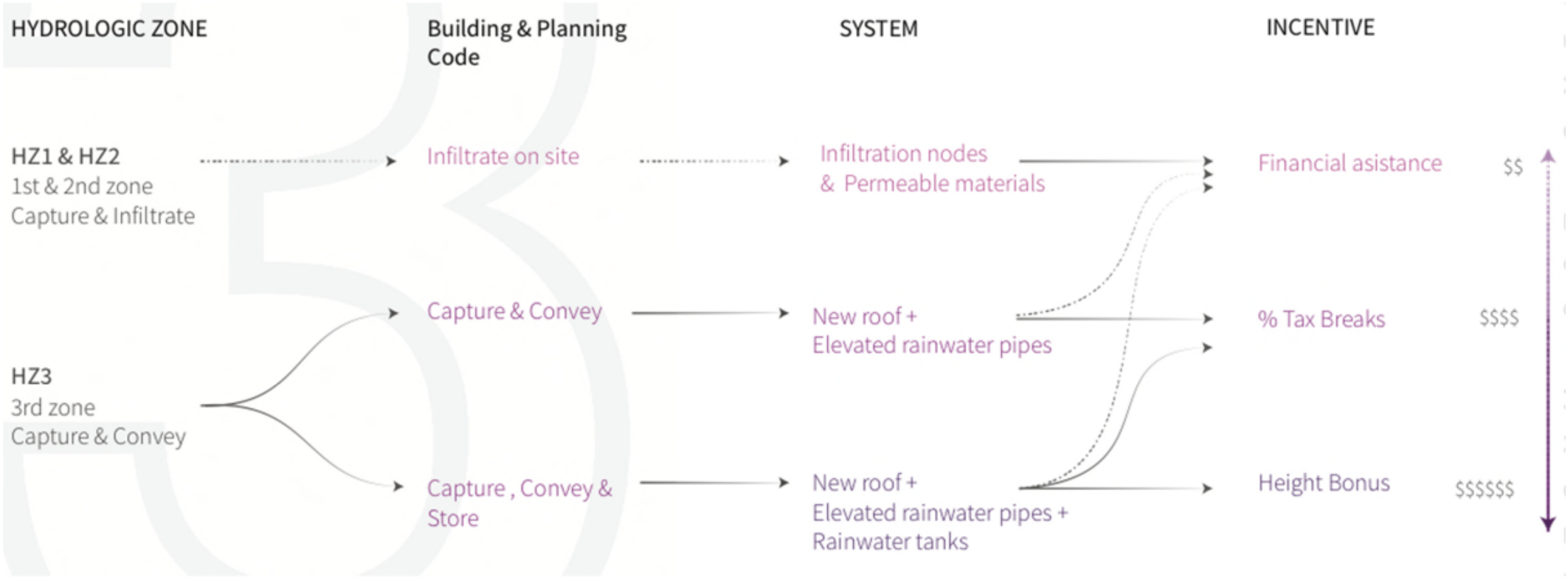
PATHS (and OBSTACLES) TO IMPLEMENTATION

water-smart ZONING



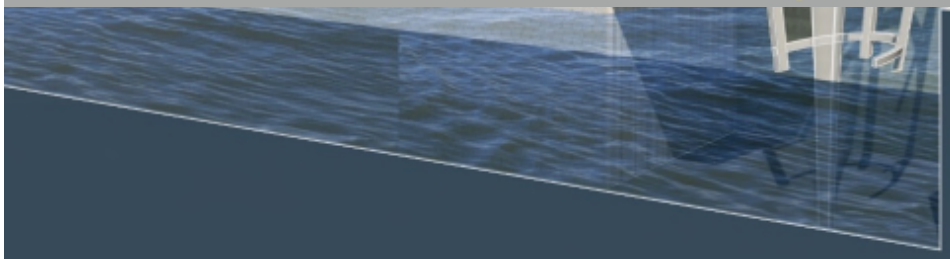
water-smart FORM-BASED CODE

Sandy Ghalli, ALI MSArch Thesis
Hydrologic Form-Based Code



water-smart CREDITS + INCENTIVES

water-smart BUILDING SYSTEMS



Doug Bergert, Anne Smith, Alec Sands. Perkins + Will
Water Tower

and a water-smart CITIZENRY.

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