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USACE TASK FORCE
VIRGIN ISLANDS PUERTO RICO
(VIPR)

ONE TEAM, ONE MISSION

DEPARTAMENTO DE RECURSOS NATURALES Y AMBIENTALES
DRNA

RPN CNT-6 DESIGN ALTERNATIVE DISCUSSION

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AGENDA:

- Project Overview & Vision
- Existing Conditions & Impacts
- Rio Piedras Main Channel
- Buena Vista Diversion Channel
- Rio Piedras Terminus

RIO PUERTO NUEVO – PROJECT OVERVIEW

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COMPLETED (COST SHARED)

CONTRACTS 1, 1A, 2A/AR, 2AA, 2C1, 2D WALLS

STATUS: 2D Walls, last completed, was May 2022

AMOUNT: $470M

- Kennedy Bridge seismic retrofit; 36-inch water line
- First 1.3 miles of channel improvements
- Quebrada Margarita channel excavation and confluence wall; lower Puerto Nuevo channel dredging
- Bechara Channel secant pile wall box culvert; 90-inch sewer line modification; open channel work
- De Diego Expressway Bridge abutments; east and west pier drill shaft reinforcement
- Quebrada Margarita Stilling Basin
- Construction of 350-foot left channel wall and 750-foot right channel wall at channel confluence.

ONGOING (SUPPLEMENTAL) CONSTRUCTION

CONTRACT - LA CHULETA

- Upland Material Management Area (future capacity of ~350,000 cubic yards of material)

REMAINING (SUPPLEMENTAL) CONSTRUCTION

CONTRACT 1 | UPPER MARGARITA CHANNEL

- Sewer line relocation
- Construction of .63 miles of channel improvements at Upper Quebrada Margarita

CONTRACT 2 | ROOSEVELT BRIDGE

- Roosevelt Avenue Bridge replacement

CONTRACT 3 | MAIN CHANNEL (RIO PIEDRAS)

- Channel walls
- 1.1 miles of Main Channel improvements

CONTRACT 4 | LAS AMERICAS BRIDGES

- Channel, Stilling Basin and Bridge Replacements
  - 4A-1: Las Americas Expressway Bridge
  - 4A-2: Piñero Avenue Bridge East
  - 4A-3: Northeast Access Ramp Bridge
  - 4A-4: Southeast Access Ramp Bridge

CONTRACT 5 | NOTRE DAME & W. PIÑERO BRIDGE

- 5A: Notre Dame Bridge replacement
- 5B: Piñero Avenue Bridge West replacement; Quebrada Josefina downstream to Río Piedras

CONTRACT 6 | MAIN CHANNEL / BUENA VISTA

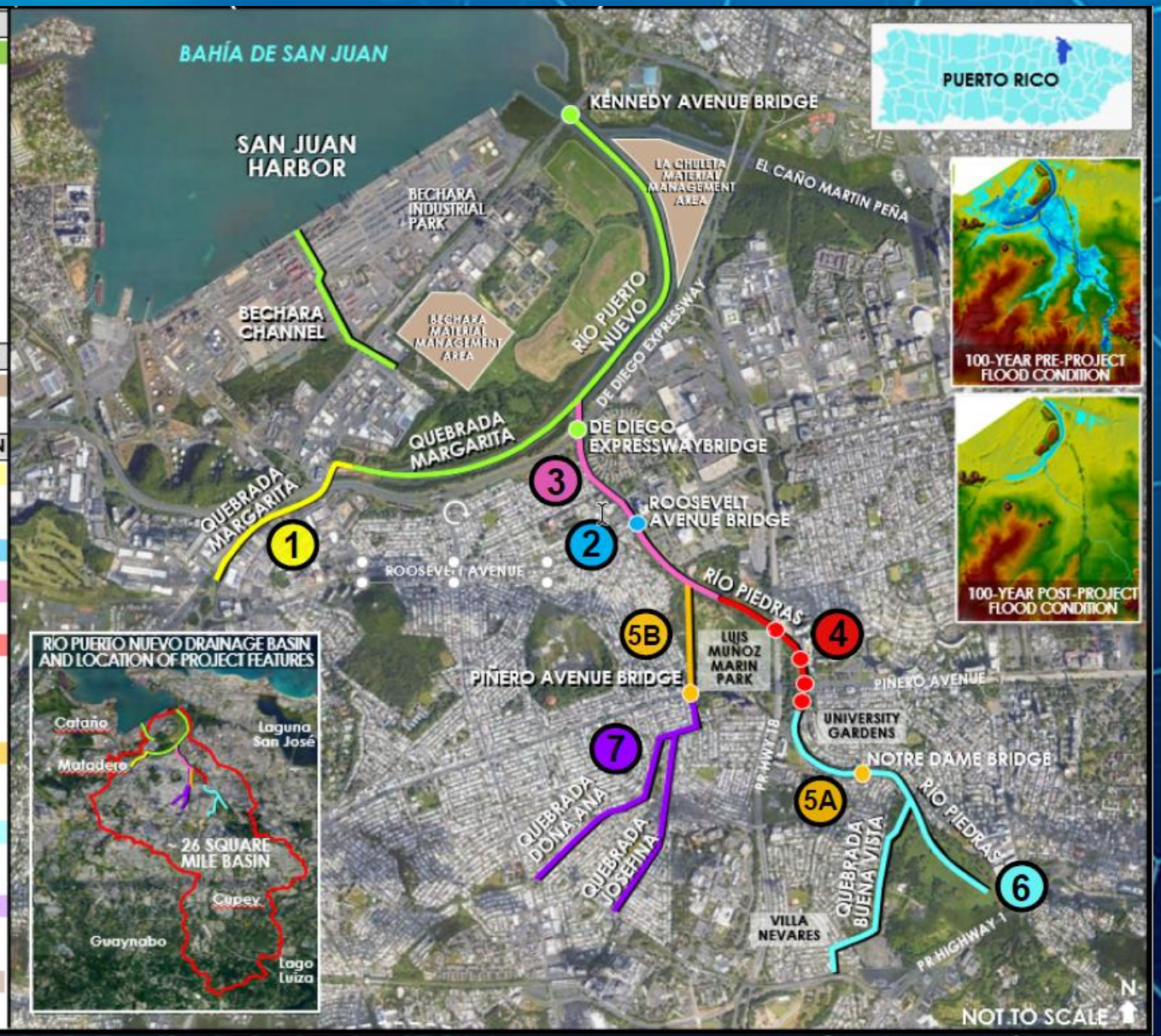
- 1.75 miles of Rio Piedras channel improvements
- 4 bridges (2 new; 2 replacements)
- .80 miles channel diversion at Quebrada Buena Vista

CONTRACT 7 | JOSEFINA & DOÑA ANA CHANNEL

- 10 bridge replacements
- 5000 LF. of Quebrada Josefina and 4400 LF. of Quebrada Doña channel improvement

CONTRACT - BECHARA

- Upland Material Management Area (future capacity of ~600,000 cubic yards of material)



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RIO PIEDRAS – EXISTING CHANNELIZED CONDITIONS

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RIO PIEDRAS – EXISTING CHANNELIZED CONDITIONS DATED: 1963

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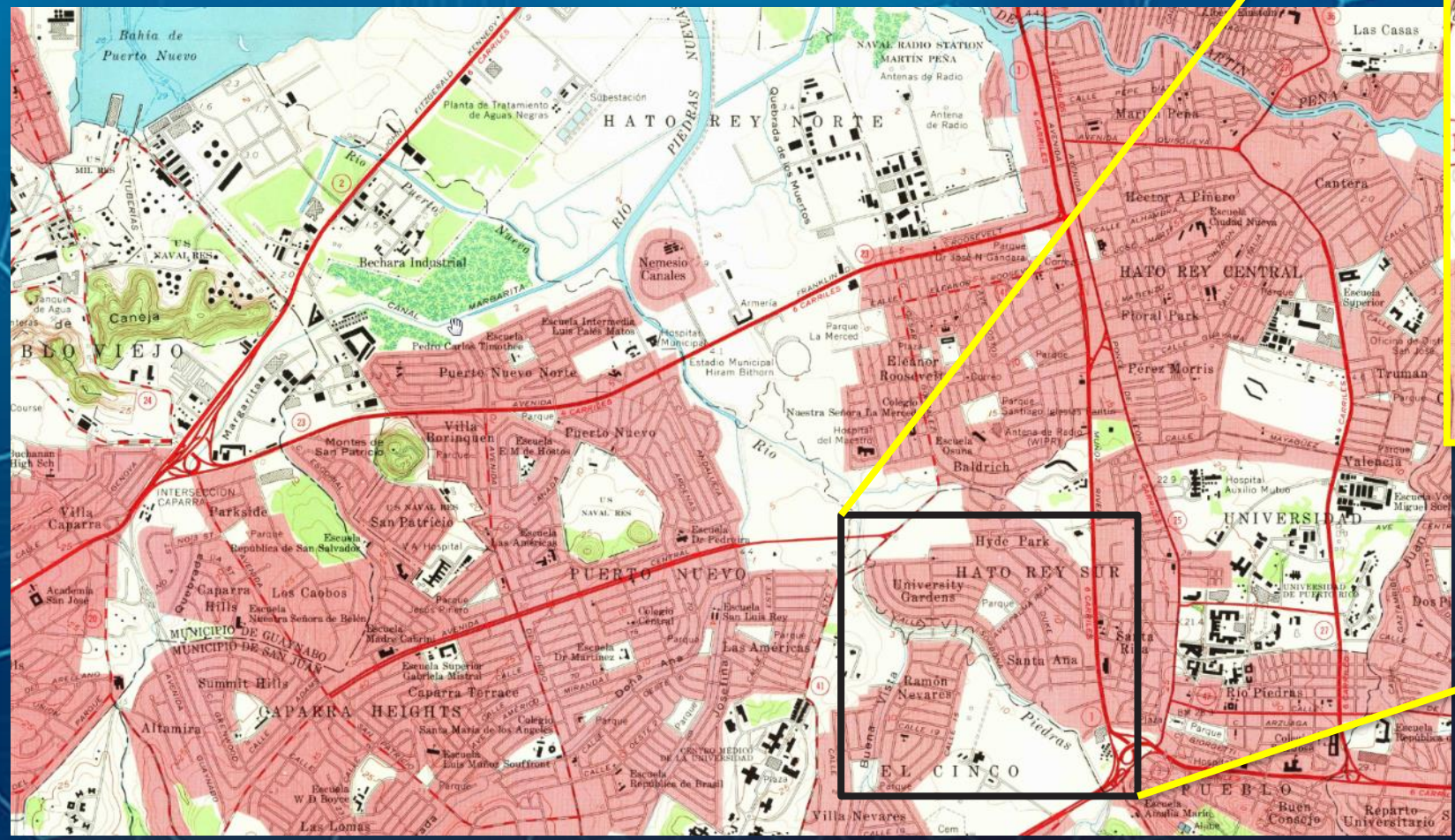
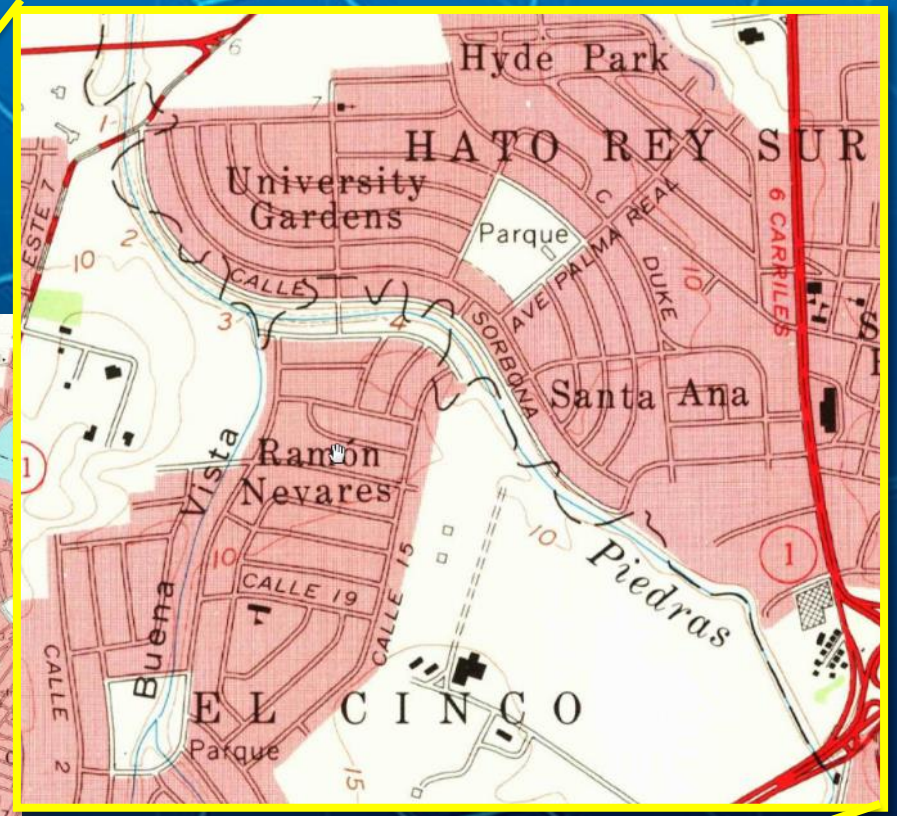
- Rio Piedras was channelized in the 1950's-1960's
- Original meandering river was changed to a man-made channel once San Juan was developed and urbanized





Legend:

Channelized River

Original Natural River

RIO PUERTO NUEVO – PRE PROJECT CONDITIONS

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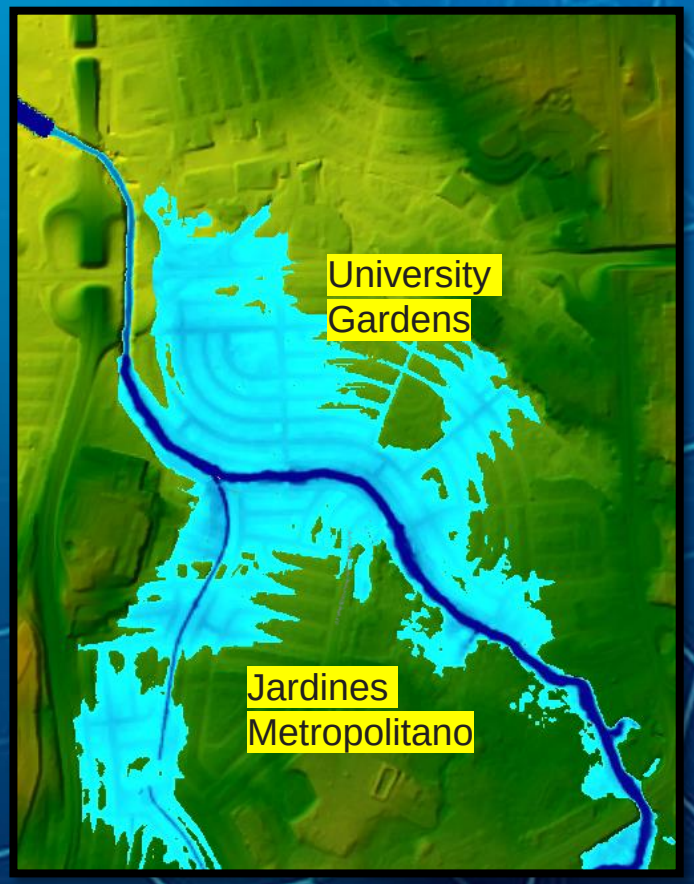
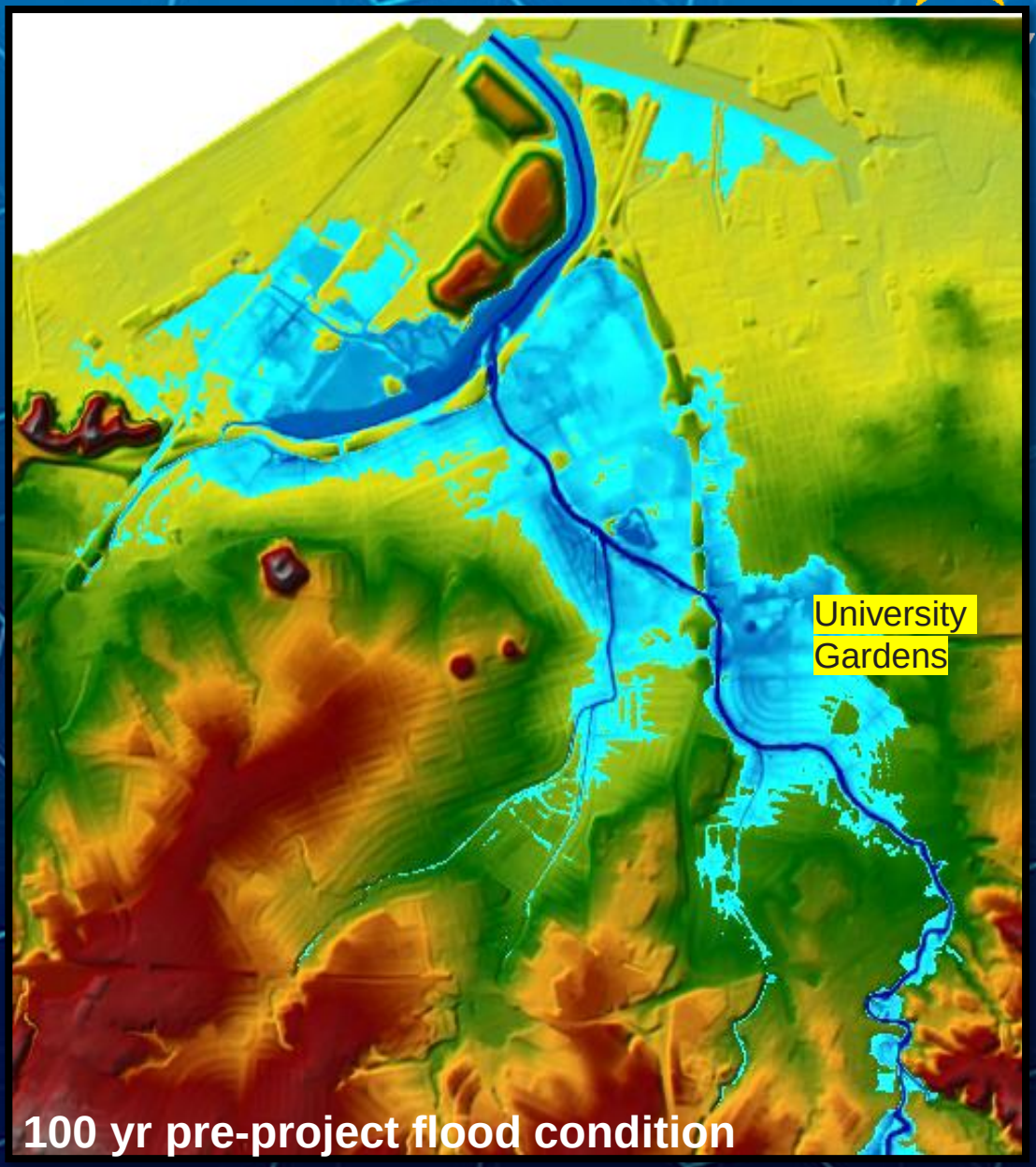
- 26 square miles of highly urbanized, densely populated flood basin
- Existing channel overflows above 2-year storm event (bank full)
- Bank full refers to the water level stage that just begins to spill out of the channel into the floodplain.
- Bank full flows tend to occur frequently, on the average every two years, its how the river form its channel; natural river process.



	Low lying areas
	High lying areas (above flood area)
	Higher elevated area
	Highest elevation in basin
	Shallow flooding area
	Heavier flooding area



RIO PUERTO NUEVO – IMPORTANCE OF PROJECT

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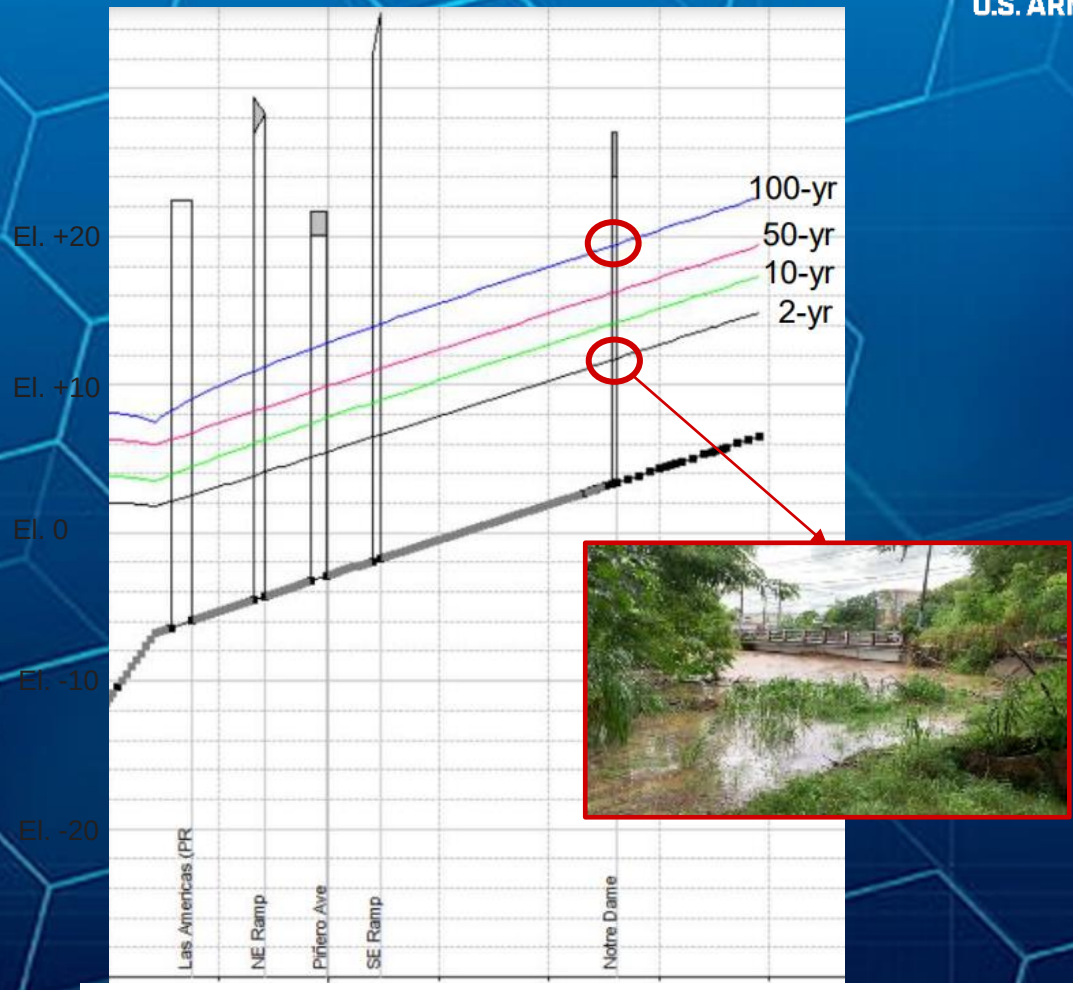
Note: Video taken on corner of Calle Interamericana and Calle Oxford showing flooding of Rio Piedras during a 5 to 10-yr storm event from Hurricane Lenny on November 15-19, 2009.

Credit: https://www.youtube.com/watch?v=T_osfiDlaqA



Note: Profile above highlights Notre Dame Bridge flooding between recently seen 1-2 yr events (~10-ft water elevation) and a 100-year storm event which would increase flooding by an additional ~8-ft.

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RIO PIEDRAS:

EXPECTED 100 YEAR FLOODING (1% CHANCE OF ANNUAL EXCEEDANCE)

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RIO PIEDRAS – RECENT FLOODING

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< 1-year storm event

13 Oct 2021 Notre Dame Bridge during flood waters from Rio Piedras. This is less than a 1-year (100% chance of occurring in a given year) storm event.

5-10-year storm event

Note: Video taken on property immediately south of Notre Dame Bridge showing flooding of Rio Piedras during a 5 to 10-yr storm event from Hurricane Lenny on November 15-19, 2009.

Credit: https://www.youtube.com/watch?v=LWmPh9Bm1UA

What will a 100-yr storm event look like in Rio Piedras?

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RIO PIEDRAS – HISTORICAL EROSION

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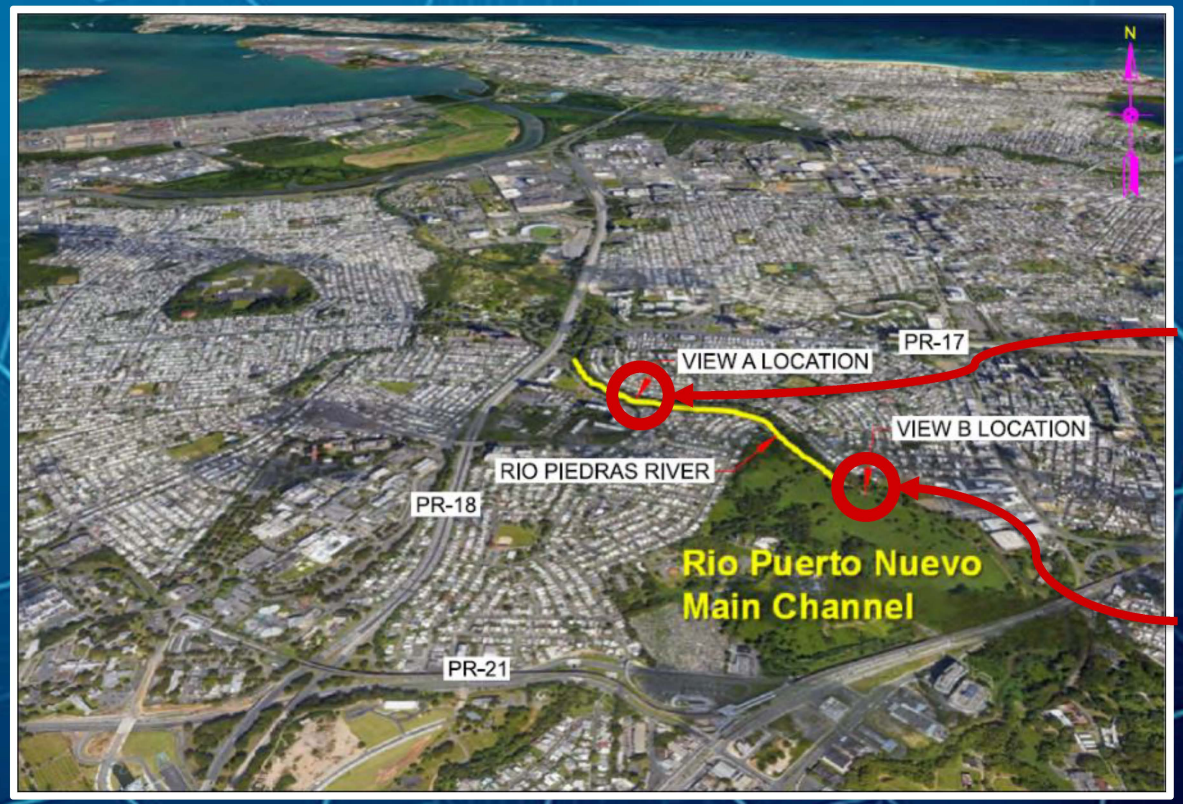

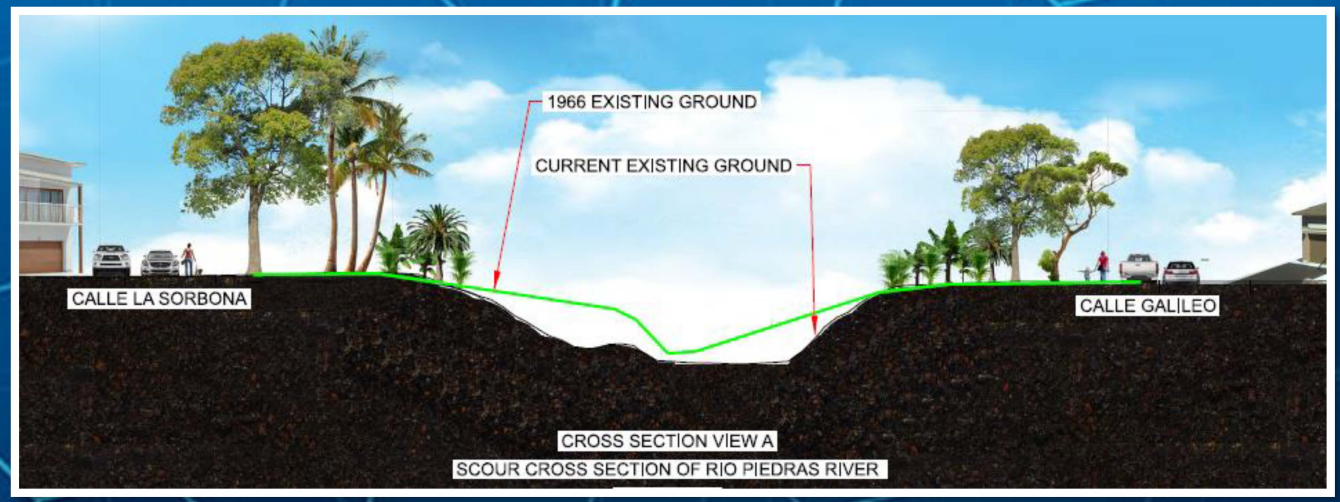

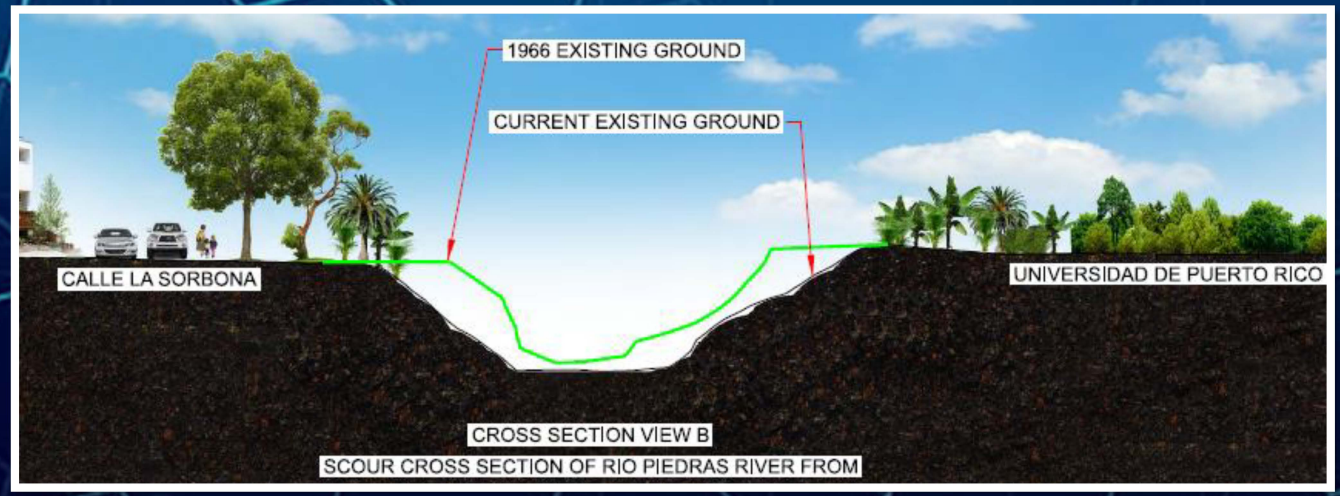

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RIO PIEDRAS – HISTORICAL EROSION

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RIO PIEDRAS – HISTORICAL EROSION

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RIO PIEDRAS – HISTORICAL EROSION

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RIO PIEDRAS – HISTORICAL EROSION

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As shown, if left alone, erosion continues and trees will eventually fall in to channel. Risks:

- Trees block bridges further increasing flood risk
- Permanently lose green space and less area to replant trees

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RIO PIEDRAS – HISTORICAL EROSION

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As shown, if left alone, erosion continues and trees will eventually fall in to channel. Risks:

- Trees block bridges further increasing flood risk
- Permanently lose green space and less area to replant trees

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RIO PIEDRAS – HISTORICAL EROSION

SEWER ENCASEMENT STRUCTURE
EXPOSED IN BANK AND RIVER BOTTOM

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CNT-6 – RIO PIEDRAS MAIN CHANNEL FEATURE

RIO PUERTO NUEVO – (CNT-6) RIO PIEDRAS DESIGN IDEAS

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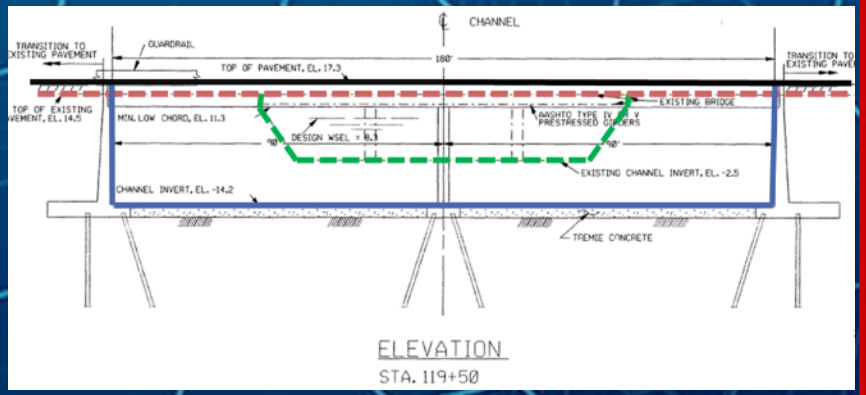
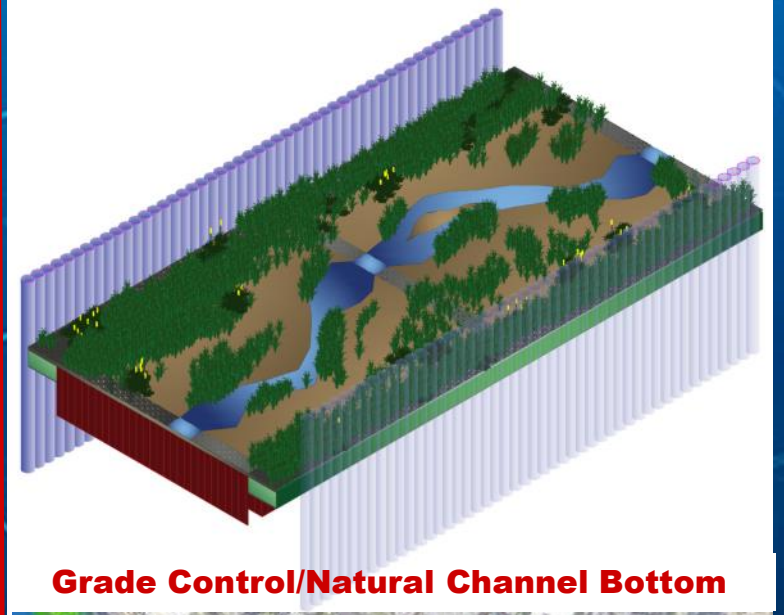
U-Frame Concrete Channel Bottom



OLD DESIGN 1991

Articulated Concrete Block Mattress Channel Bottom

DESIGN UPDATE 2021-2022



Grade Control/Natural Channel Bottom

NEW DESIGN - 2023

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RIO PUERTO NUEVO – (CNT-6) RIO PIEDRAS CONCEPTUAL DESIGN IN URBAN CORRIDOR

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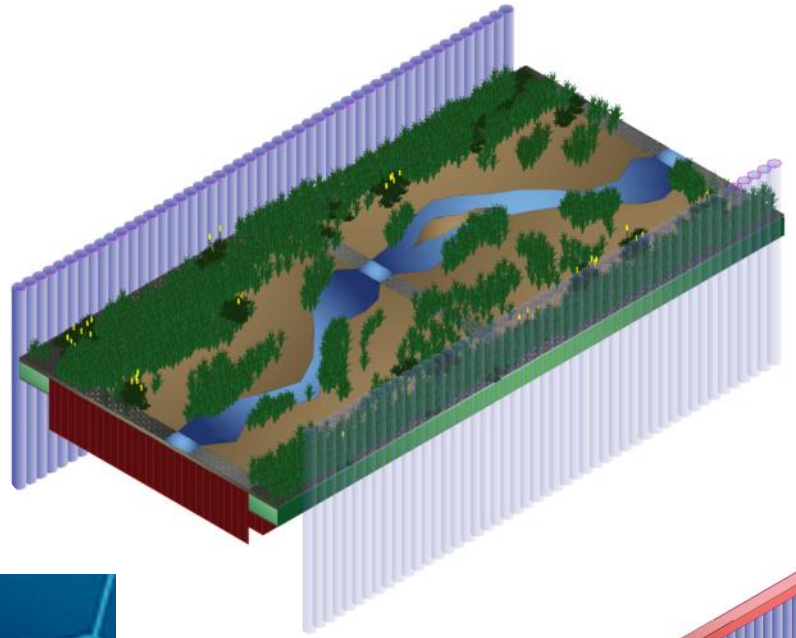

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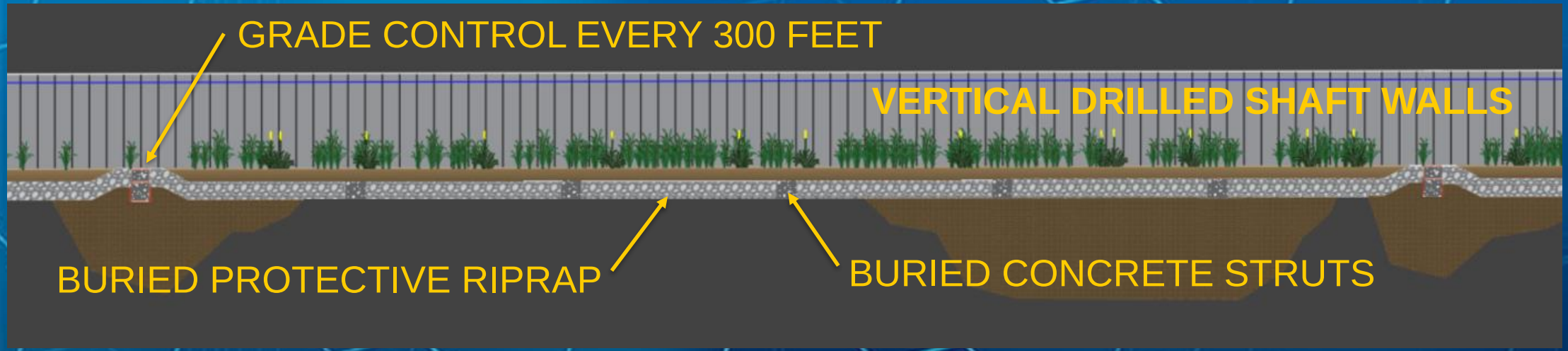
RIO PIEDRAS – CURRENT DESIGN



- Buried layer of riprap between concrete struts
- Concrete grade control structures with low-flow notches
- 2-foot-deep natural material stream bottom

- Low flow channel can meander
- Grasses and small bushy vegetation allowed to grow
- Rare high flows likely we strip out much of the vegetation, which will replenish quickly

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SIMILAR GRADE CONTROL STRUCTURE DESIGN

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Sweetwater River – San Diego, CA
Use of riprap grade control to maintain channel with alluvial bottom

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SIMILAR GRADE CONTROL STRUCTURE DESIGN

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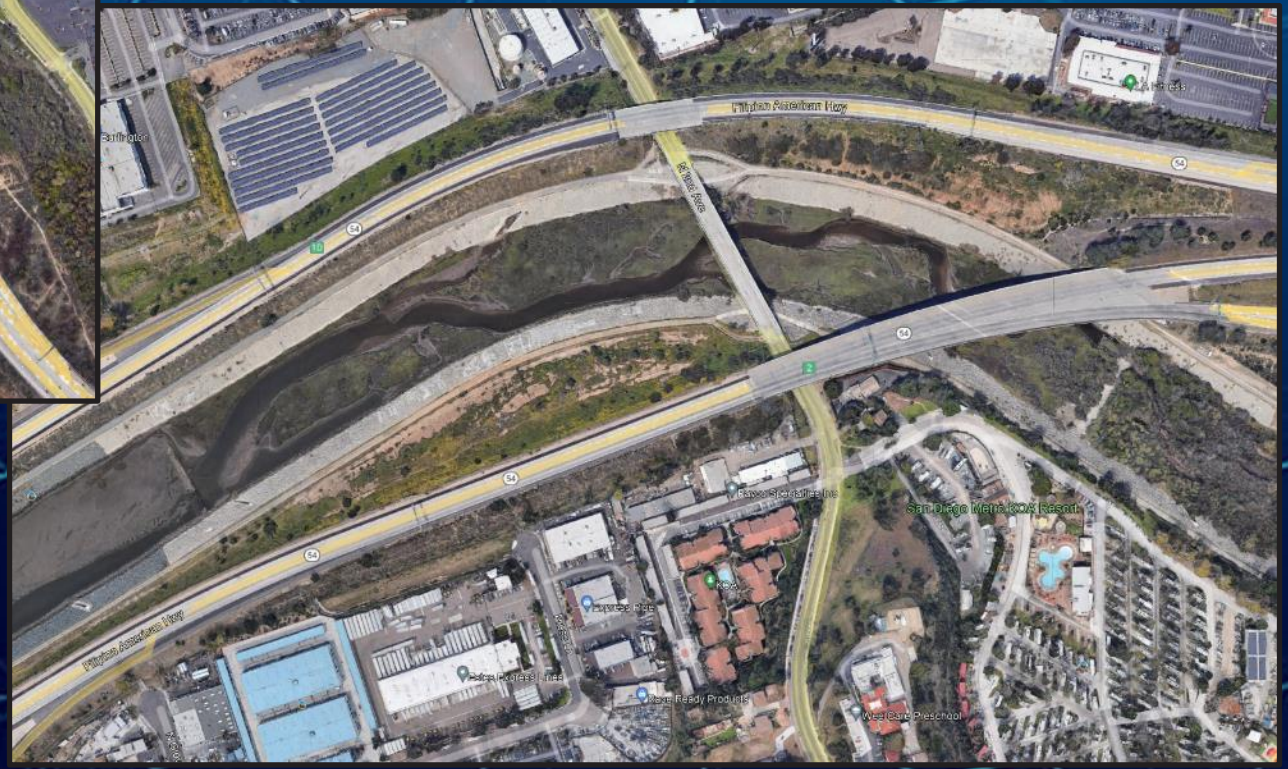
Sweetwater River – San Diego, CA
Use of riprap grade control to maintain channel with alluvial bottom

Stream ends under tidal influence (evident in pictures)



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CNT-6 – BUENA VISTA DIVERSION CHANNEL FEATURE

RIO PUERTO NUEVO – CNT 6 – BUENA VISTA CHANNEL

IMPACTS AND RESIDUAL RISKS TO ENVIRONMENT

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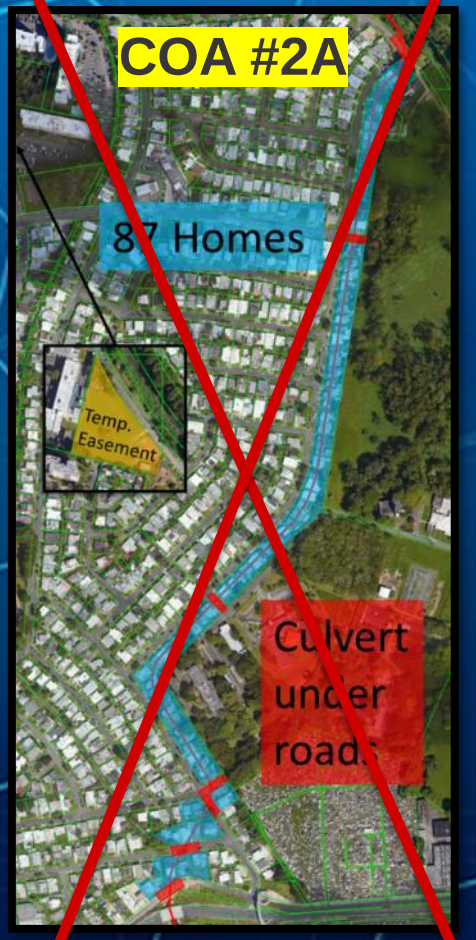
IMPACTS: There are two types of environment we need to look at. Social and Ecological

- Social/Real Estate:
  - Base Design - Least amount of impacts with **13** acquisitions
  - COA #1A – Greatest impact – **113** homes acquisition
  - COA #2A – Significant impact **87** homes acquisition
- Note: COA #1A and 2A would both have increased impacts to utility relocations, MOT and temporary bridges. This would have additional effect on the lives of the surrounding community during construction beyond acquisitions and relocations.
- Ecological:
  - Base Design – The effects are minimal, as the only impact to ecology would be temporarily excavating and removing material to construct culvert. Any impacts to vegetation would be replaced.
  - COA #1A – There would be some impacts to municipal parks for staging. There are trees that would need to be removed adjacent to channel.
  - COA #2A – Least amount of ecological impact as channel would run directly along path of existing homes.
- Cultural Resources:
  - Base Design – Surveyed for historic properties, design avoids impacts to properties eligible for the National Register of Historic Places.
  - COA #1A – New cultural resources survey needed.
  - COA #2A – New cultural resources survey needed.

(Construction within Ecological Corridor)
- Ideal Design Alternative
- Least Cost Alternative
- Significantly less Relocation of residents.

- Significant residential acquisition and relocations
- Significant utility relocation (including siphon & 115kv power)
- Temporary and Permanent bridges with significant MOT
- Close proximity to homes
- O&M requirements



- Significant residential acquisition and relocations
- Significant utility relocation (including siphon & 115kv power)
- Temporary and Permanent bridges with significant MOT
- Close proximity to homes
- O&M requirements

RIO PUERTO NUEVO – CNT 6 – BUENA VISTA CHANNEL

COA#2B ALTERNATE DESIGN

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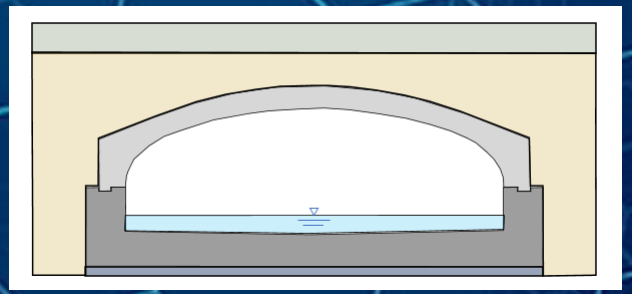
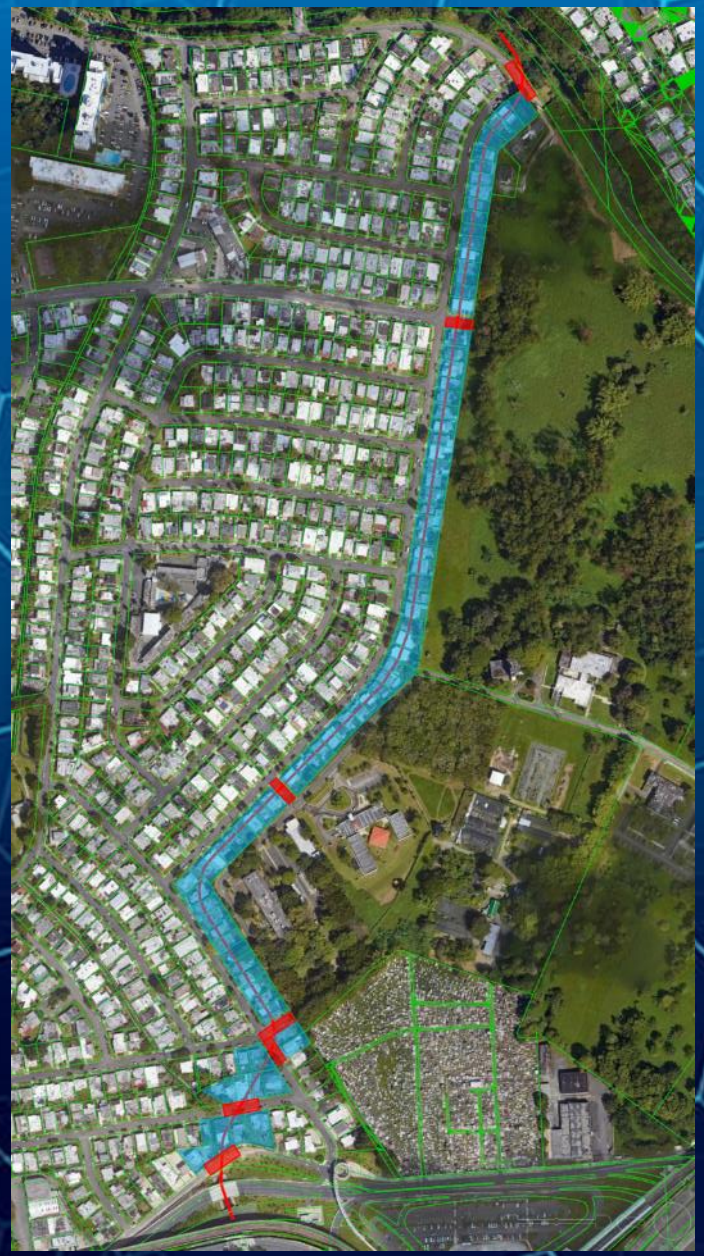
Buena Vista
Recommended Design

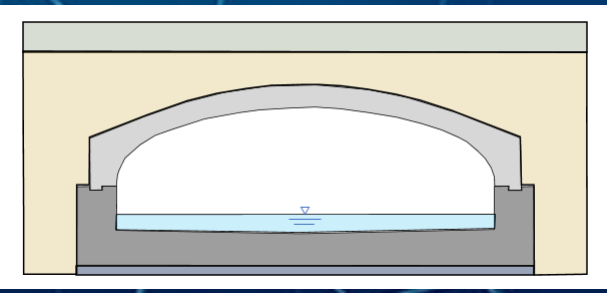
- On UPR land / Ecological Corridor
- Minimal Impact to environment
- Requires no home acquisition
- Majority is buried culvert





Buena Vista Alternative 2
(Not recommended)

- Does not encroach on UPR land / Ecological Corridor
- Requires ~87 homes
- Construction disturbances close to homes
- Majority is buried culvert



RIO PUERTO NUEVO – CNT 6 – BUENA VISTA CHANNEL

DO NOTHING ALTERNATIVE

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PRE-PROJECT:

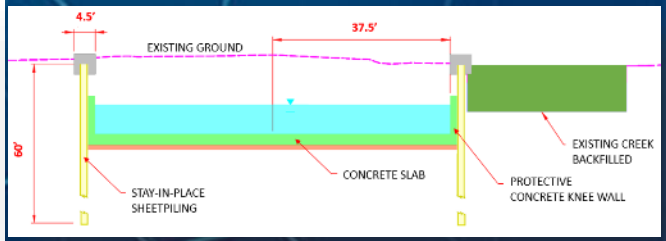
DO NOTHING: Below discusses an already considered option to not construct the Buena Vista bypass channel and leave in existing channel. **Up to 7.5' of flood impacts would remain**

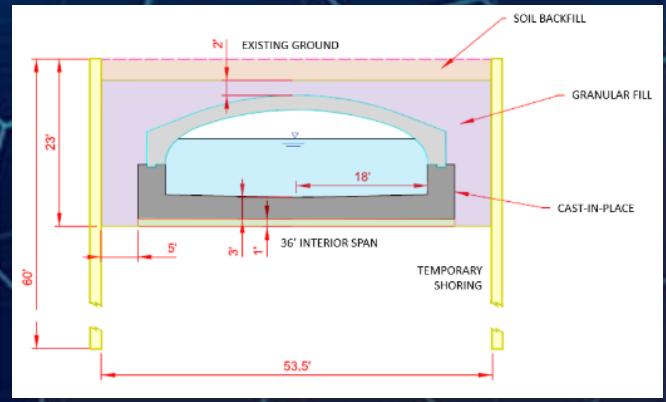
- Estimated 400 homes remain within 100-yr floodplain
- Estimated house inundation depths range from 0 to 6 feet

BASE DESIGN: Full economic benefits are captured as intended. Modeling verifies this design approach. Recommended design.

COA #1A: Not in consideration

COA #2A: Not in consideration.





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CNT-6 – RIO PIEDRAS TERMINUS CHANNEL FEATURE

RIO PUERTO NUEVO – CNT 6 – RIO PIEDRAS TERMINUS

IMPACTS, RISKS TO ENVIRONMENT, H&H CHALLENGES AND REDUCTION OF BENEFITS

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IMPACTS: There are two types of environment we need to look at. Social and Ecological

- Social/Real Estate:
  - Base Design – No additional RE Acquisition
  - COA #1B – No additional RE Acquisition. Floodwall would obstruct view to the river, and be an eyesore to the adjacent community.
  - COA #2B – No additional RE Acquisition, Approximately 200-250 homes will remain impacted by street/surface with ~2-ft of residual flood.
- Ecological:
  - Base Design – The effects are minimal, as we will perform excavation on the UPR land, remove trees. However, benefits and improvements to river would be captured by restoring banks with rock revetment and natural channel bottom, vegetation planted within the disturbed area.
  - COA #1B – Impacts would include some tree removal for access along that bank.
  - COA #2B – No direct impact, however, remaining flooding would continue to do existing impacts during large events.
- Cultural Resources:
  - Base Design – Surveyed for historic properties, design avoids impacts to properties eligible for the National Register of Historic Places.
  - COA #1A – Cultural resources survey needed.
  - COA #2A – Cultural resources survey needed.

BENEFITS / IMPACTS: There are no reduction in benefits due to additional land acquisition.

- Base Design – Captures all the benefits. Designed storm is contained within the river/channel.
- COA #1B – Flood wall would capture all the benefits. Floodwall would prevent flooding from entering the University Gardens community and effectively channel the flood thru the Rio Piedras.
- COA #2B – Flooding would remain There would still be risk of flooding within the UPR property and would impact approximately 200-250 homes within University Gardens. Most flooding would not enter homes however ~40 homes could experience some minor flooding.

RIO PUERTO NUEVO – CNT 6 – RIO PIEDRAS TERMINUS

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H&H CHALLENGES AND REDUCTION OF BENEFITS – COA#1B - FLOODWALL

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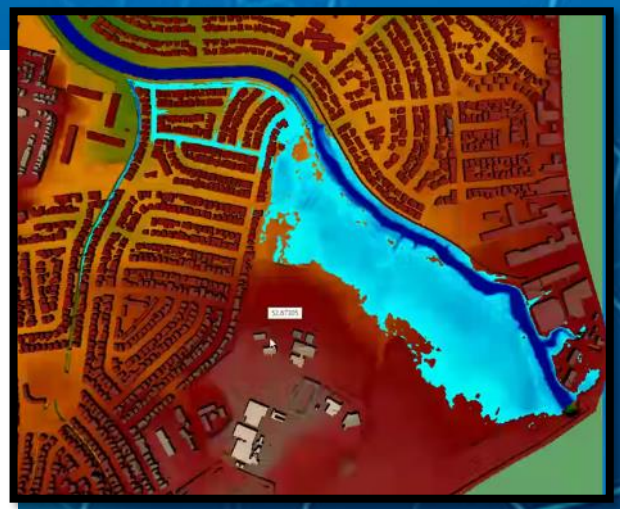
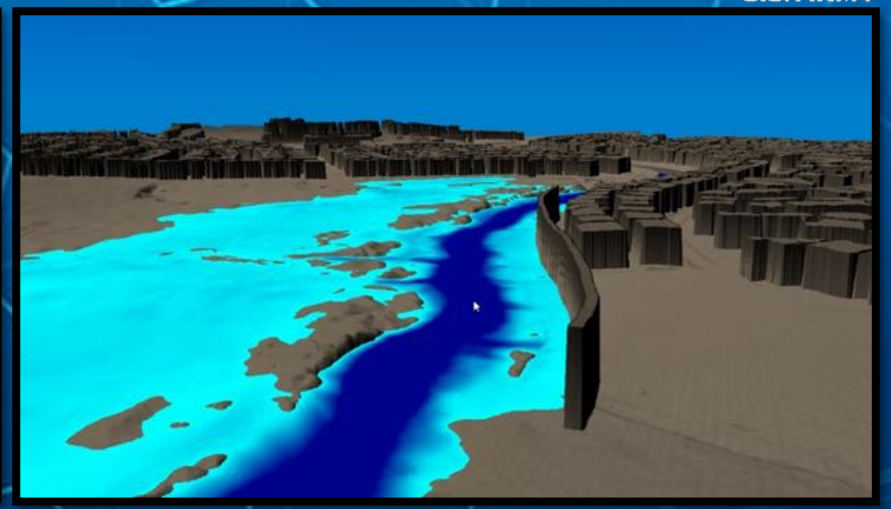
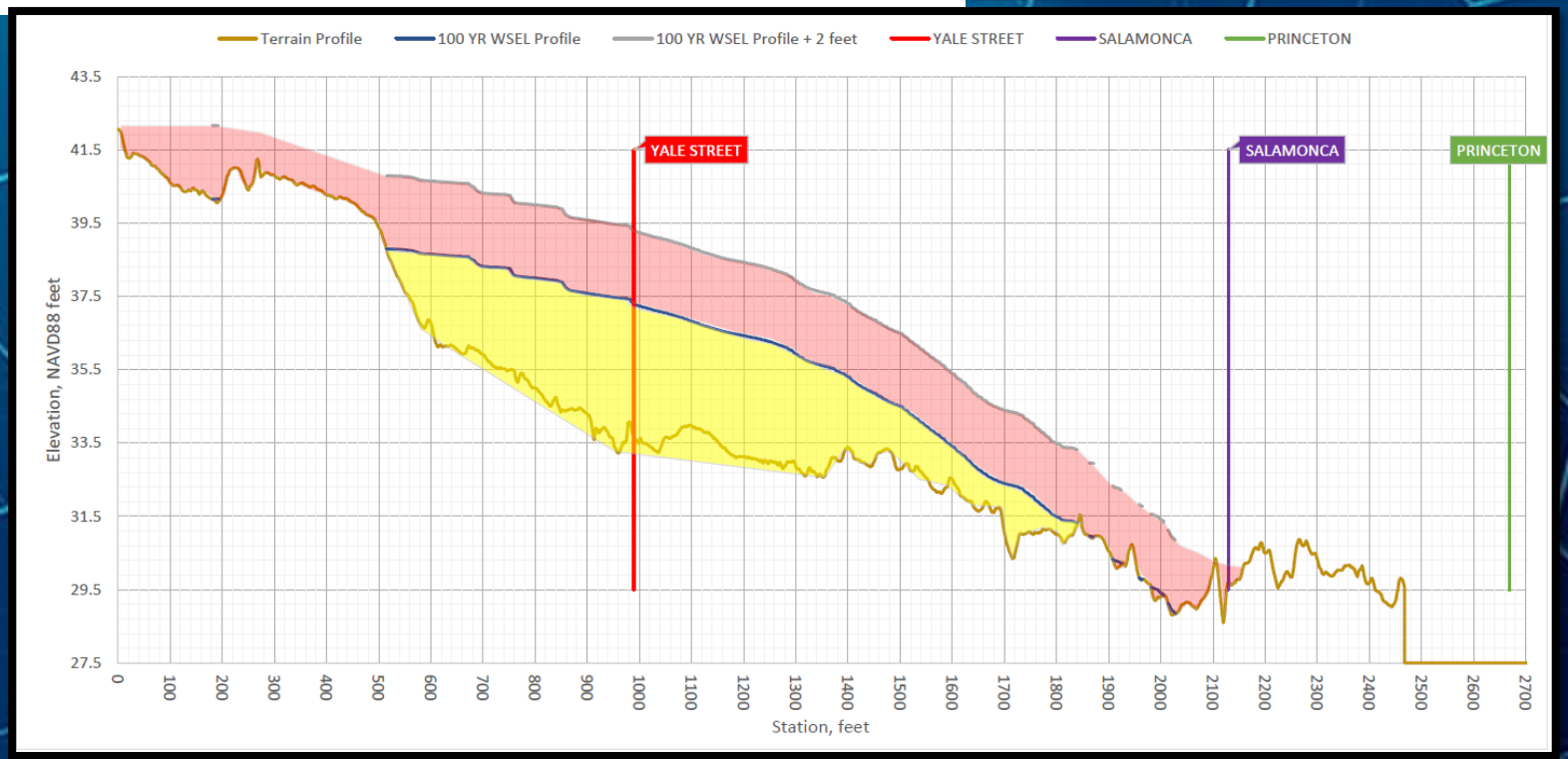
IMPACTS TO BENEFITS WITH FLOODWALL DESIGN IDEA

COA #1B:

- Images to right depict preliminary modeling results of the floodwall.
- The wall would prevent the flooding from entering the University Gardens area
- Floodwall adds about 0.3' of additional flooding (above existing conditions) to UPR. No takings would result as this would be maintained on UPR land.
- Graphics below shows stage and average height of wall. Varies from 2' to 6' throughout span.
- Construction would occur completely outside of Ecological Corridor.







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RIO PUERTO NUEVO – CNT 6 – RIO PIEDRAS TERMINUS

H&H CHALLENGES AND REDUCTION OF BENEFITS – COA#2B – NO ACTION

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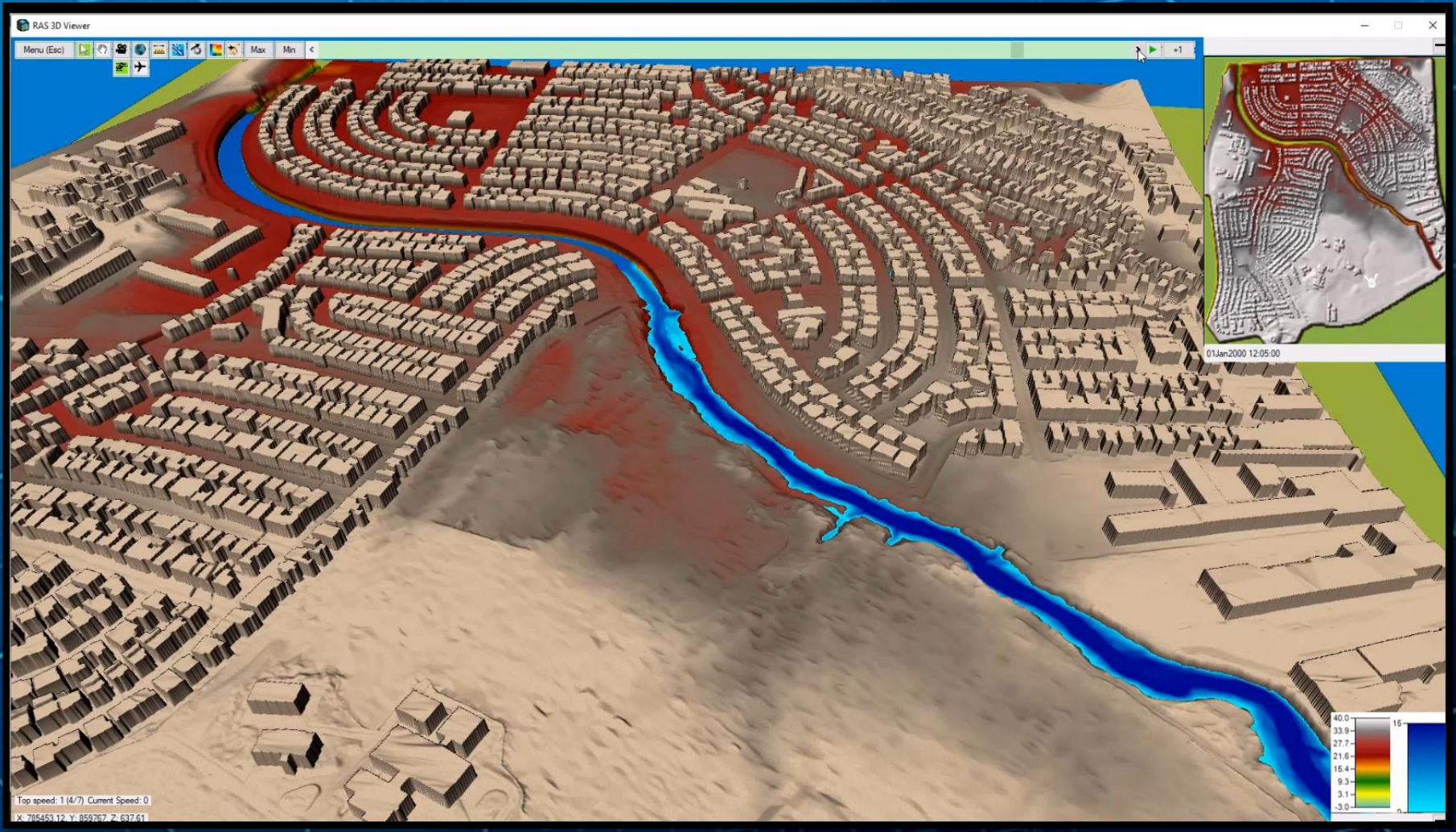
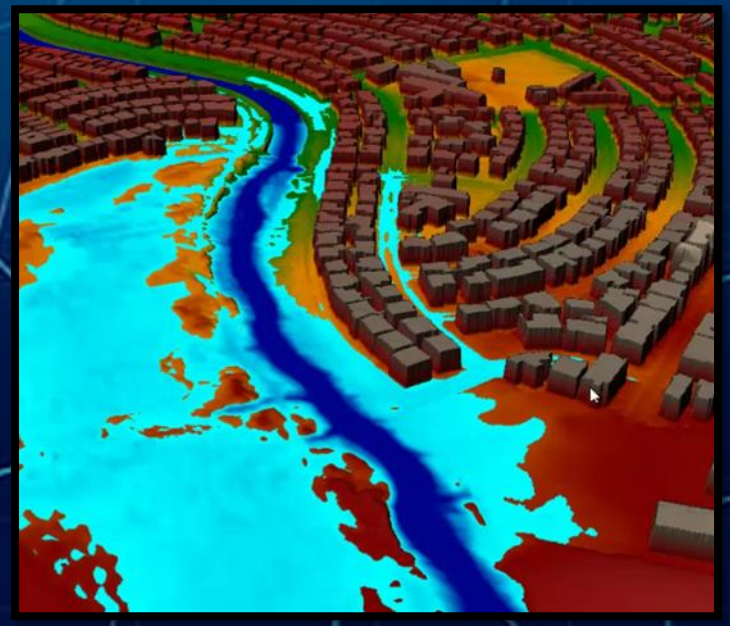


IMPACTS TO BENEFITS - NO CONSTRUCTION

COA #1B:

- Video to left shows model of no action. Flooding impacts would continue.
- Impact to approximately 200-250 homes, albeit nuisance surface flooding. There could be direct flooding impact to approximately 40 homes.



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RIO PUERTO NUEVO –RIO PIEDRAS TERMINUS DESIGN

BASE DESIGN - **RECOMMENDED ALTERNATIVE**

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RECOMMENDED DESIGN

- Terminus Channel connects to existing Rio Piedras where river continues upstream.
- River is natural channel bottom and trapezoidal sloped rock revetment banks.
- Replacement of impacted Trees.

RIO PUERTO NUEVO –RIO PIEDRAS TERMINUS DESIGN

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BASE DESIGN - Recommended Alternative

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RECOMMENDED DESIGN

- Terminus Channel connects to existing Rio Piedras where river continues upstream.
- River is natural channel bottom and trapezoidal sloped rock revetment banks.
- Replacement of impacted Trees.

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MOVING FORWARD WITH CHANGE

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RIO PUERTO NUEVO: REALIZED BENEFITS FROM COMPLETED PROJECT

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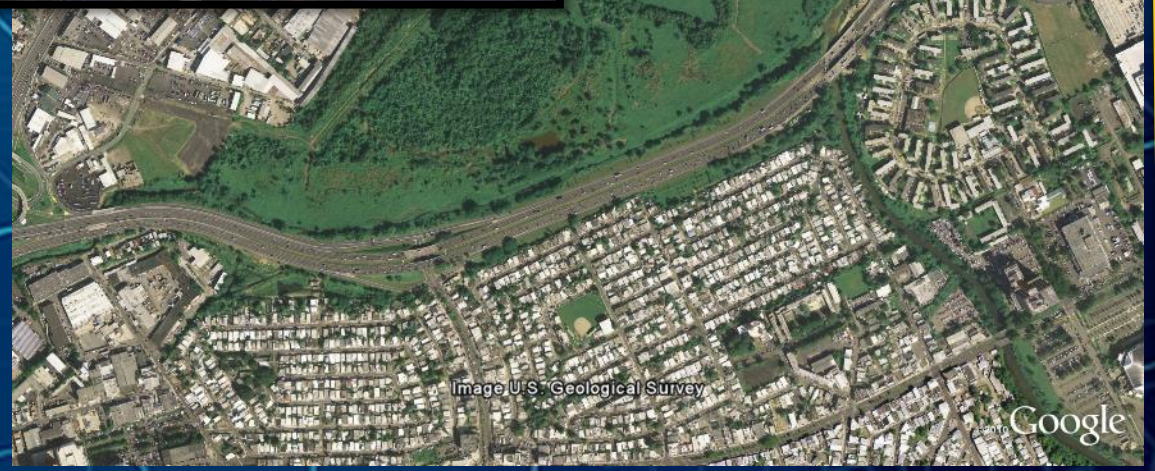
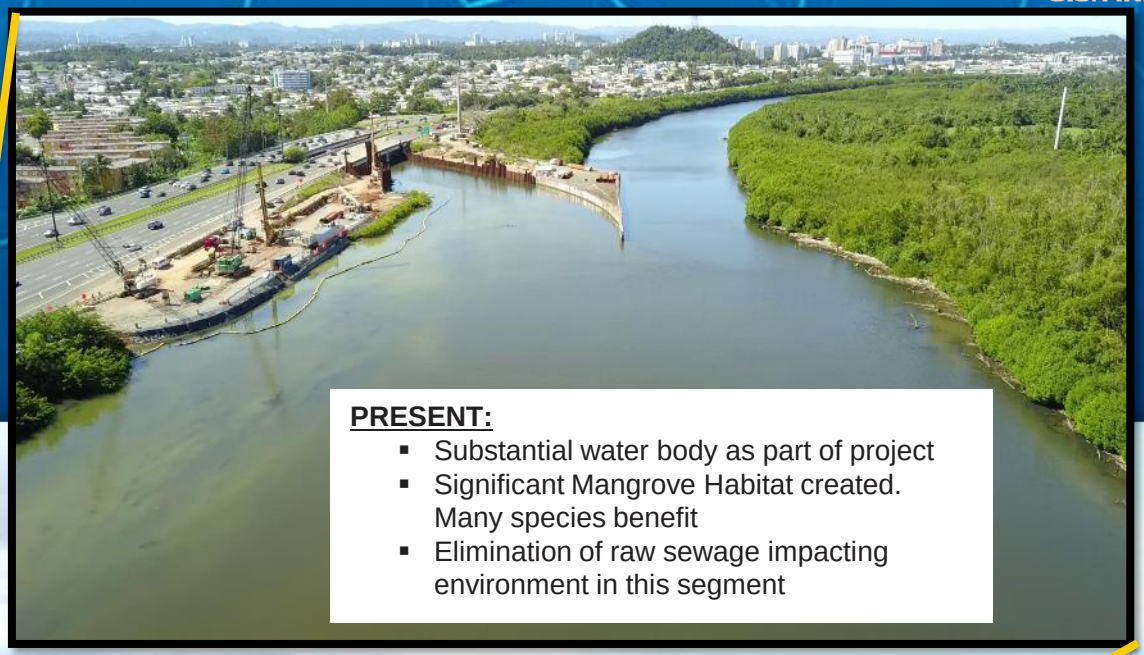
2000-2015

- Note little vegetation and narrow creek that existed prior to project
- Environmental Habitat substantially created as part of project





PRESENT:

- Substantial water body as part of project
- Significant Mangrove Habitat created. Many species benefit
- Elimination of raw sewage impacting environment in this segment

RIO PUERTO NUEVO – NEPA TIMELINE

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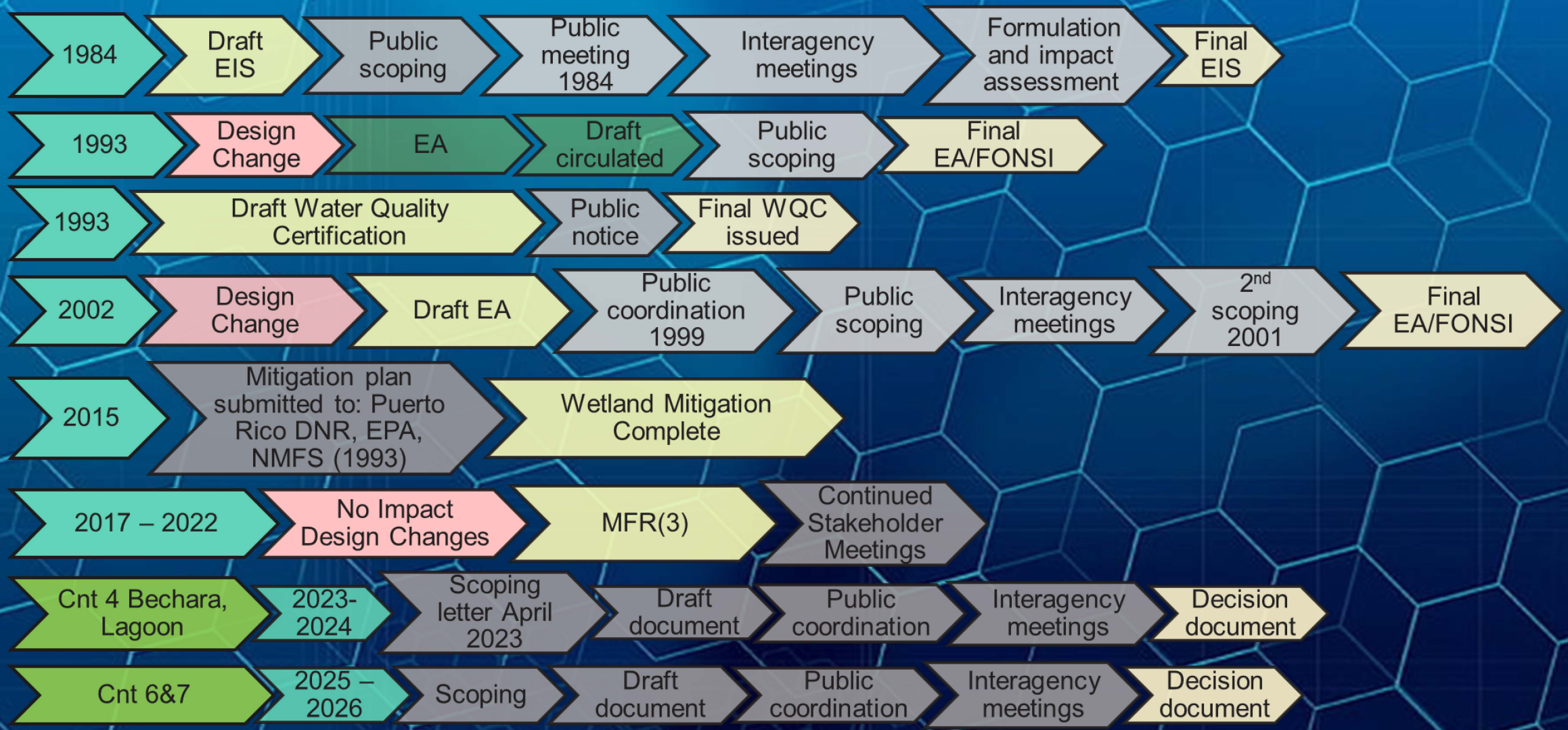

RIO PUERTO NUEVO – RECREATIONAL FEATURES

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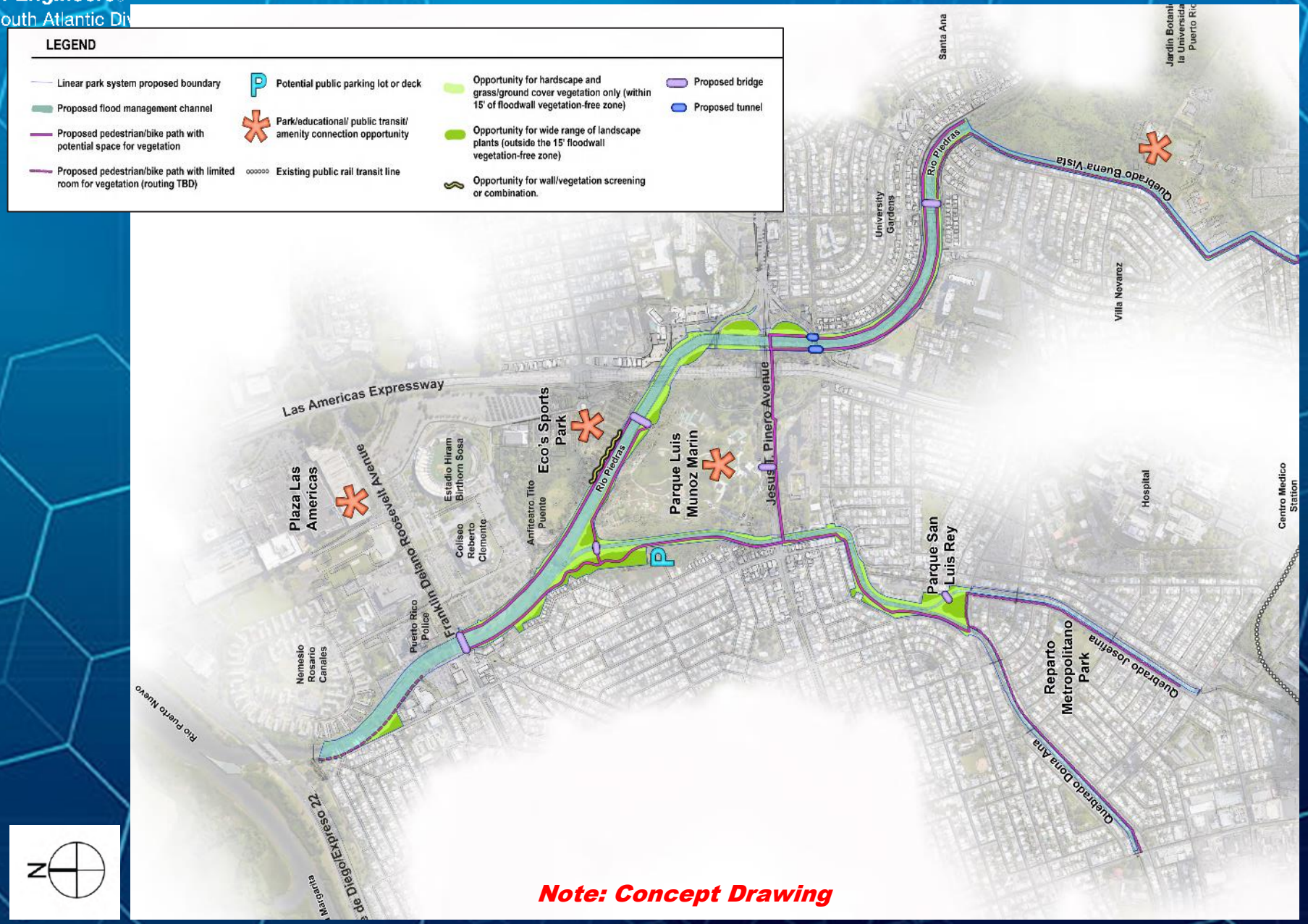

Note: Concept Drawing

LINEAR PARK/BICYCLE PATH:

- Plans for a linear park and bike path that connects all communities adjacent to the project to the Luis Muñoz Marin Park.
  - Includes a path from Puerto Nuevo Norte (thru Roosevelt Avenue Bridge)
  - Includes linear park and paths from Reparto Metropolitano thru Piñero Avenue pedestrian crossing.
  - Includes a path from University of Puerto Rico through the Villa Nevares / Jardines Metropolitano / University Gardens areas, crossing over at Notre Dame Bridge
- Replanting of vegetation and trees equal in number to the ones removed (native, noninvasive species)

- One Service Bridge connecting both sides of park at the southern end of Luis Munoz Marin Park

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WHERE ARE WE NOW? / WHERE WILL WE BE?

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PURPOSE: The primary purpose of the authorized project is to improve human health and safety, and to provide additional incidental economic benefits (recreation, redevelopment, etc.) through flood risk management and reduction in damages to structures, contents, and transportation infrastructure within the Río Puerto Nuevo Basin.

EXISTING IMPACTS:

- Continued risk to health and safety of communities:
- Impacts to environment, economy, infrastructure and personal property
- Trees along the bank will continue to fall in and block river flow

CONSTRUCTION TEMPORARY IMPACTS:

- Minor temporary impacts to environment during construction
- Removal of Trees to allow construction access
- Maintenance of Traffic
- Temporary Inconvenience

BENEFITS:

- Significant reduction of flood risk to San Juan and communities adjacent to project
- Improved Infrastructure (new utilities, replaced sanitary sewer and electrical)
- New bridges and roadways that are alongside project
- New Linear Parks and recreational areas adjacent to the project
- New landscaping and Native trees along project

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QUESTIONS?

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