

The Richmond shoreline. Photo by TJ Gehling is licensed under CC BY 2.0.

Local Assessments Section: G EAST BAY CRESCENT Operational Landscape Unit

JURISDICTIONS WITHIN THIS SECTION

Contra Costa County

Alameda County

Richmond El Cerrito Albany Berkeley Emeryville Oakland



HOW TO USE THE LOCAL ASSESSMENTS



WHO IS THIS FOR?

Anyone interested in understanding their local shared vulnerabilities to flooding and sea level rise.

Local jurisdictions

- Cities
- Counties
 - Special Districts
 - Utilities Providers •

Stakeholder Groups

- Non-profits/NGOs
- For-profits/Private
- Associations
- Interested Parties

General Public

- Residents
- State/Regional
 - Caltrans
 - MTC/ABAG

HOW IS IT ORGANIZED?



Local assessments are organized by four regional systems assessed: Transportation, Vulnerable Communities, Priority Development Areas (PDAs), and Priority Conservation Areas (PCAs).

Each part of the local assessment provides varying levels of details at three scales: 1) Operational Landscape Unit (OLU), 2) Individual Descriptions, and 3) Shared Stories of Vulnerabilities in Focus Areas/Areas of Impact. This assessment can be reviewed in whole, or individual parts can be reviewed separately depending on interest and level of detail desired.



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Where are we in the region?

This OLU stretches along the shoreline of the central San Francisco Bay from the City of Richmond at its northernmost edge through the Cities of Albany, Berkeley, Emeryville, and Oakland in the south. It spans both Contra Costa and Alameda counties. This area contains a range of land uses including business and industrial areas, residential households, retail and commercial uses, as well as multiple areas of recreation including the Point Isabel Regional Shoreline, Golden Gate Fields, Cesar E. Chavez Park, and the McLaughlin Eastshore State Seashore Park. The shoreline in this area varies, with the majority of the shoreline being fortified by shoreline protection structures and transportation structures, including a portion of the I-580 serving as the first line of defense in one area. Additionally, other parts of the shoreline consist of wetlands, embankments and natural shorelines. It is a densely populated area, and also contains many contaminated sites.



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What regional systems are here?

Operational Landscape Unit (OLU) boundaries were used to organize and help identify regionally significant assets that were co-located together (Methodology can be found in Section 3.0 Local Assessments).

The map on page G-4 shows the entire OLU, including all the regional systems present. Colors are used throughout this document to help navigate across these four regional systems. Individual assets that were assessed as part of this local vulnerability assessment are listed in the bullets below and can also be found on the labels on the map (Figure 1g).

Figure 1g. MAP OF REGIONAL SYSTEMS AND LIST OF INDIVIDUAL ASSETS ASSESSED WITHIN BELOW:



TRANSPORTATION

- I-580
- 1-80
- I-880
- Port of Richmond
- Port of OaklandUnion Pacific Rail
- Union Pacific Rall (UPRR)
- Burlington-Northern Santa Fe railroad (BNSF)
- Richmond Pacific Railroad (RPRR)
- Amtrak/Capital Corridor Emeryville Station
- Local Roads



VULNERABLE COMMUNITIES

- Iron Triangle/ Central Richmond
- Richmond Annex/ El Cerrito
- West Oakland
- Berkeley
- Emeryville



PRIORITY DEVELOPMENT AREAS (PDAs)

- South Richmond PDA
- Mixed-Use Core (Emeryville) PDA



PRIORITY CONSERVATION AREAS (PCAs)

- San Francisco Bay Trail PCA
- Regional Trail System Gap PCA
- San Francisco Bay Water Trail Sites (8) PCA
- Cerrito Creek PCA
- Oakland Priority Creeks PCA
- Potential Oakland Gateway Area PCA

-OCAL ASSESSMENT 0LU: EAST BAY CRESCENT

What was assessed?



I-580 • Interstate 580 (also known as the MacArthur Freeway in this area) is an east-west Interstate Highway, running from San Rafael to Tracy in the Central Valley. It provides a connection from the Bay Area to the southern San Joaquin Valley and Southern California via Interstate 5. The average annual daily traffic is 84,500 vehicles¹ and 5,458 trucks² per day. The section of I-580 in this OLU is a connection point for the Port of Richmond. It is exposed beginning at 48" TWL at on-ramps at Canal Boulevard and flooding extent increases as water levels rise.

I-80 • Interstate 80 (also known as the Eastshore Freeway in this area) is a major east-west Interstate Highway, running from San Francisco east across the I-80 San Francisco-Oakland Bay Bridge (Bay Bridge) to Oakland, where it turns north along the shoreline in this OLU and then crosses the Carquinez Bridge before turning back northeast through the Sacramento Valley. The I-80 provides for the critical movement of goods and commuters traveling between Contra Costa, Alameda, and San Francisco Counties, and provides access to other areas of the East Bay via connections at I-580 and I-880, averaging 225,500 vehicles³ and 9,431 trucks⁴ per day. It is an important route for transit agencies across the region. More than 27 bus routes use the I-80 San Francisco-Oakland Bay Bridge, carrying a total of around 14,000 daily passengers.⁵ The I-80 San Francisco-Oakland Bay Bridge is also a designated Caltrans lifeline route.⁶ In this OLU, I-80 is a ten-lane highway

and is first exposed to flooding at the I-80 San Francisco-Oakland Bay Bridge touchdown and toll plaza, affecting westbound HOV lanes beginning at 24" TWL. Larger sections of the toll plaza, administrative buildings, and fueling facilities are impacted at 36" TWL. Eastbound lanes near the touchdown become exposed at 66" TWL. Other sections of I-80 also become exposed beginning at 66" TWL and impacts to this transportation route increase significantly as TWL increases. By 108" TWL, significant portions of the I-80 are completely flooded. Additionally, this route provides ad-hoc flood protection and in some segments serves as the first line of shoreline defense for numerous communities and businesses behind it.

I-880 • Interstate 880 is an eight lane north-south highway, with its northern terminus in Oakland at the junction of I-80 and I-580, known as the MacArthur Maze, near the eastern approach of the I-80 San Francisco-Oakland Bay Bridge. It runs parallel to the Bay connecting Oakland to San Jose and serves the Port of Oakland, Oakland International Airport, Norman Y. Mineta San Jose International Airport, and key East Bay cities. From a regional perspective, I-880 provides a critical link for the movement of goods between the Port of Oakland and the Central Valley and averages 25,359 trucks per day.⁷ I-880 is also critical for commuter movement between significant residential and commercial areas and job centers and averages 237,000 vehicles per day.⁸ In this OLU, I-880 stretches for only a few miles at the southern edge of the OLU near the I-80 San Francisco-Oakland Bay Bridge touchdown. Flooding begins at 52" TWL at the northbound lanes in an area of I-880 just south of this OLU and within the San Leandro (18) OLU. However, flooding at one portion of the I-880 will impacts its use as a commuter and movement of goods route within this OLU.

Port of Richmond • The Port of Richmond is a deep-water port located in the City of Richmond along the City's inner harbor. In 2012, the Port had the highest amount of liquid bulk and automobile tonnage out of the San Francisco Bay Area's five ports.9 It also handles dry-bulk, break-bulk and containers. The port includes five city-owned and ten privately owned terminals. The Port is linked to inland parts of the region, state, and nation through rail lines, including UPRR and BNSF lines, as well as roads including I-580 and Canal Boulevard. On dock, rail service is provided to many of the terminals by UP and BNSF rail lines and there is truck access to I-580 from the port. The seaport supports employment in a variety of sectors, ranging from port-specific jobs such as longshoremen, to rail and truck operators. Portions of the northern end of the seaport begin getting exposed to flooding starting at 36" TWL. By 48" TWL, significant flooding occurs on the seaport property, and extends into West Cutting Boulevard, Canal Boulevard, and the railroad tracks that serve the Port, cutting off critical access for road or rail movement of Port goods. Flooding also occurs at the Port of Richmond Terminal 2 at 48" TWL. Flooding impacts increase significantly with increasing TWLs.

Port of Oakland • The Port of Oakland is a deep-water port located in the City of Oakland along the Oakland Outer Harbor Channel, Middle Harbor Enhancement Area, Oakland Estuary/Harbor Channel, Middle Harbor, and Inner Harbor areas. It was the first major port on the Pacific Coast of the United States to build terminals for container ships. In 2017 it was the eighth busiest port in the United States by cargo volume and handled 99 percent of containerized goods moving through Northern California.¹⁰ The Port of Oakland's maritime facilities include berth terminals, railway terminals, twenty deep water berths and thirty-five container cranes.¹¹ It is owned and operated by the Port of Oakland, which is an autonomous department of the City of Oakland that is governed by a Board of Commissioners and funds its own operations. In this OLU, the Port of Oakland includes the areas around the I-80 Bridge touchdown, which begin being impacted by flooding at 24" TWL. A threshold occurs at 52" TWL, when flooding impacts significant areas of the port, including the East Bay Municipal Utilities District's (EBMUD) Wastewater Treatment Facility. In the San Leandro OLU, the Port is first exposed to flooding at 48" TWL on the western edge of the Charles P. Howard Terminal, when flooding overtops a shoreline protection structure at the Clay Street Ferry Terminal. By 52" TWL, significant flooding occurs along Embarcadero West, across Middle Harbor Road and into the Union Pacific/BNSF Railway area. Flooding impacts increase significantly with increasing TWLs.

*Note, the Port of Oakland spans the border of this OLU and San Leandro OLU.

Union Pacific Railroad • Union Pacific Railroad (UPRR) is an important heavy freight rail supporting the reliable movement of goods to markets across the Bay Area. The Union Pacific Martinez Subdivision between the Port of Oakland and Martinez is the busiest rail segment in Northern California, carrying both goods and commuters. Freight volumes on the Union Pacific Martinez Subdivision are the highest in the region, and overall freight rail demand is anticipated to grow throughout the Subdivision, making it the largest bottleneck on the freight rail system in the Bay Area.¹² The rail connects many Bay Area ports and connects to areas outside the region. On this rail line, the Burlington Northern Santa Fe (BNSF) and Richmond Pacific Railroad (RPRR) have trackage rights, while Amtrak, Capitol Corridor, and San Joaquin have passenger rights. Union Pacific Railroad (UP) owns the right-of-way for the rail line from the county boundary in Richmond, around the coast, and past I-680. On average, the UPRR rail line is used by 50 passenger trains and 12 freight trains daily. In this OLU, the UPRR runs the entire length of the shoreline, connecting the Port of Richmond in Contra Costa County to the Port of Oakland in Alameda County. It becomes exposed to flooding at 48" TWL, where a major siding yard near the port of Richmond is flooded. At 52" TWL, major segments serving the Port of Oakland become impacted, including most of the rail yard at the Port of Oakland. This also includes segments that carry the Amtrak and Capitol Corridor services through Emeryville. The rail serves as ad-hoc flood protection in this area, protecting many communities and businesses behind it.

Amtrak/Capital Corridor Emeryville Station • UPRR track in this area serves as critical passenger rail and commuter rail services by Amtrak/Capital Corridor routes, which connect San Jose to Sacramento and provide transit connections across the region. Due to its proximity to the I-80 San Francisco-Oakland Bay Bridge, it is a primary connection point for Amtrak trains and the Amtrak Thruway Motorcoach bus service and provides service to other bus routes in the area.¹³ In this OLU, the Amtrak/Capital Corridor provides service to the Emeryville Station. The station is exposed beginning at 66" TWL.

Burlington Northern Santa Fe • Burlington Northern Santa Fe (BNSF) is the largest freight railroad network in North America. BNSF owns and operates rail line from Richmond to Martinez, although UPRR holds trackage rights in this segment that are not currently in use. The BNSF line parallels the UPRR line from Richmond to Pinole, heads inland, and then rejoins the UP line near Bay Point. BNSF operates between 20-30 freight trains on the BNSF owned rail lines.¹⁴ Within this OLU, segments connecting the rail line to the Port of Richmond begin to get exposed at 48" TWL, as well as sections near West Ohio Street, which provide ad-hoc flood protection for the Atchison Village neighborhood in the Richmond community.



Richmond Pacific Railroad • Richmond Pacific Railroad (RPRR) is short-line railroad terminal owned by the Levin-Richmond Terminal Corporation. The RPRC leases 11 miles of track, owned by UPRR and BNSF, in the shipping terminal and wharves supporting operations at the Port of Richmond. RPRC operates on tracks south of I-580, between South 11th Street and Regatta Boulevard in the Richmond Harbor area, on tracks adjacent to I-580 south to Berkeley, and north to Chesley Avenue along the UP right-of-way, and a section of track between Chesley Avenue and Chevron's Richmond Refineries yard. The RPRC interchanges with the UPRR and BNSF. Cargo includes stone, ores, lumber, food products and petroleum products¹⁵. Hazardous materials are also transported through this corridor. RPRR runs two trains with 10 to 20 cars on the northern tracks, and as many as 32 trains with two to 20 cars per day on the southern tracks and handles over 22,000 carloads annually.¹⁶ Within this OLU, segments begin to get exposed at 36" TWL at the Port of Richmond adjacent to West Cutting Boulevard. Larger sections connecting the rail line to the port are exposed at 48" TWL.

Local Roads • Cutting Boulevard (exposed at 48" TWL), Canal Boulevard (exposed at 48" TWL), Harbor Way (exposed at 66" TWL), Marina Way South (66" TWL), Regatta Boulevard (exposed at 66" TWL) and Marina Way Parkway (exposed at 77" TWL) serve as main arterials through this OLU and are exposed to flooding.



Richmond at the end of Harbor Channel. I-580 is to the north. Map data @2019 by Google.

VULNERABLE COMMUNITIES



Richmond. Map data ©2019 by Google

Iron Triangle/ Central Richmond • For the purposes of this report, 5 block groups were assigned to a functional community called "Iron Triangle/ Central Richmond." The block groups that were assessed can be referenced in the appendix. This is a placeholder designation for a set of block groups that have a moderate, high, or highest social vulnerability ranking within the Iron Triangle, Central Richmond area. We have provided some history and context for these areas, primarily gathered via desktop research, and in some cases stakeholder and community vetting. This should be considered a starting point. Before this is used for any planning purposes, this data should be ground-truthed and vetted with the communities considered. Similarly, block groups or communities with a similar vulnerability rank could and likely will have very different needs, considerations, and capacities that are critical to bring into the planning process.

There are many neighborhoods and distinct communities that exist across the City of Richmond. In this assessment, we include the details for block groups in this OLU that exhibit social vulnerability characteristics and are exposed to flooding impacts and refer to this as the "Iron Triangle/Central Richmond Community." This includes five block groups that make up parts of the Iron Triangle, Atchison Village, Coronado Community, Port of Richmond and Cortez – Stege neighborhoods, which make up approximately 10,000 people. In this description, we acknowledge that we are not members of the community and thus we cannot speak on behalf of the lived experiences of its residents.

Our intent of this description is to elevate this community as part of the region's interconnected systems and help set a sense of place.

Residential households in the Iron Triangle/ Central Richmond community begin to be impacted by flooding starting at 36" TWL, with small areas of the Iron Triangle and Atchison Village affected. At 48" TWL, flooding impacts residents in the Panhandle Annex in Richmond. By 66" TWL, additional residential households are exposed, and flooding increases significantly in the area from 77" TWL and higher.

Five block groups within the Iron Triangle/ Central Richmond community are considered moderate, high or highest social vulnerability. Residents within the Richmond community block groups have slightly different characteristics; however, the following twelve social vulnerability characteristics are exhibited in at least one block group in the 70th percentile, with eleven characteristics in the 90th percentile in the region (Figure 2g).

SOCIAL VULNERABILITY PERCENTILES IN IRON TRIANGLE/ CENTRAL RICHMOND



SOCIAL VULNERABILITY RANK:



GENTRIFICATION AND DISPLACEMENT RISK:

Moderate High Income -Not Losing Low Income Households



At Risk of Gentrification and/or Displacement

Ongoing Gentrification and/or Displacement *

*In block groups considered, this ranking occurred most frequently. Data Source: ART Bay Area Regional Community Vulnerability Indicators, BCDC (2018).



- Low Income Not U.S. citizens Without a vehicle People with disability Communities of Color Limited English proficiency Without a high school degree Under 5 Severely housing cost burdened 65 and over living alone
- Single parent households Renters

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In this section, social vulnerability was used as the starting place for analysis. Contamination burden was assessed only for the block groups included in the functional community groupings. This means that there could be block groups that score in the moderate, high, or highest for contamination burden that were not ALSO in the designated functional community grouping that were not considered. In short, we only look at areas that have contamination burden if they are also ranked as socially vulnerable.

The communities of Richmond have long endured a history of heavy industrial land uses in this area. In the early 1990s, multiple heavy industrial companies moved into the area, including Standard Oil, which later became Chevron, the Ford Motor Company Assembly Plant, and Pullman Railroad Company, among others.¹⁷ Additionally, the Richmond waterfront became a central location for shipbuilding activities during World War II, recruiting and employing thousands of working from across the United States, many of which were African Americans from the Midwest and South.¹⁸

The legacy of contaminated lands and hazardous sites from these industrial uses remains today. The Chevron Oil Refinery Plant is located near the Richmond



community, and between 1989 and 1995 alone, the Chevron plant had 304 industrial accidents, including chemical spills and explosions.¹⁹ In 2012 a catastrophic pipe failure at the Refinery led to a major fire at the facilities and the release of toxic vapor clouds into the surrounding community, where over 15,000 people sought medical treatment due to release.²⁰ These industrial activities have led to poor air quality and health issues for nearby communities that continue today, and flooding impacts will only exacerbate existing issues and concerns.

Within the Iron Triangle/Central Richmond community, there are multiple contaminated sites, including sites listed by the California Department of Toxic

Substances Control (DTSC), California Water Quality Control Boards Groundwater Threats, and Leaking Underground Storage Tanks. Additionally, this area has one former federally listed Superfund within the community at a site called "Liquid Gold", the former Zeneca site. There are also two additional Superfund sites adjacent to the community located at the Port of Richmond, both called the "United Heckathorn Co" sites.²¹

Within the Iron Triangle/Central Richmond community, there are also high percentages of contamination vulnerability. The following five sources of contamination are exhibited in at least one block group in the 70th percentile, with four sources in the 90th percentile in the region (Figure 3g).

CONTAMINATION BURDEN PERCENTILES IN IRON TRIANGLE/ CENTRAL RICHMOND



CONTAMINATION **BURDENS RANK:**



*In block groups considered, this ranking occurred most frequently. Data Source: ART Bay Area Regional Community Vulnerability Indicators, BCDC (2018).



Hazardous cleanup activities Groundwater threats Hazardous waste facilities Impaired water bodies

Richmond Annex / El Cerrito • For the purposes of this report, 7 block groups were assigned to a functional community called "Richmond Annex/El Cerrito." The block groups that were assessed can be referenced in the appendix. This is a placeholder designation for a set of block groups that have a moderate, high, or highest social vulnerability ranking within the Richmond and El Cerrito area. We have provided some history and context for these areas, primarily gathered via desktop research, and in some cases stakeholder and community vetting. This should be considered a starting point. Before this is used for any planning purposes, this data should be groundtruthed and vetted with the communities considered. Similarly, block groups or communities with a similar vulnerability rank could and likely will have very different needs, considerations, and capacities that are critical to bring into the planning process.

Seven block groups are considered moderate high, or highest social vulnerability. Twelve social vulnerability characteristics are exhibited in at least one block group in the 90th percentile in the region (Figure 4g).

SOCIAL VULNERABILITY PERCENTILES IN RICHMOND ANNEX / EL CERRITO

90th percentile •

Figure 4g. Social Vulnerability Characteristics: In block groups considered for Richmond Annex/ El Cerrito, all 12 characteristics are within the 90th percentile in the region.



SOCIAL VULNERABILITY RANK:



GENTRIFICATION AND DISPLACEMENT RISK:

 Moderate High Income -Not Losing Low Income Households
 At Risk of Gentrification and/or Displacement *
 Ongoing Gentrification and/or Displacement

*In block groups considered, this ranking occurred most frequently Data Source: ART Bay Area Regional Community Vulnerability Indicators, BCDC (2018).



Low income

Not U.S. citizens Without a vehicle People with disability Single parent households Communities of Color Limited English proficiency Without a high school degree Under 5 Severely housing cost burdened 65 and over living alone Renters



In this section, social vulnerability was used as the starting place for analysis. Contamination burden was assessed only for the block groups included in the functional community groupings. This means that there could be block groups that score in the moderate, high, or highest for contamination burden that were not also in the designated functional community grouping that were not considered. In short, we only look at areas that have contamination burden if they are also ranked as socially vulnerable.

Four contamination burdens are exhibited in at least one block group in the 90th percentile in the region (Figure 5g).

CONTAMINATION BURDEN PERCENTILES IN RICHMOND ANNEX / EL CERRITO

CONTAMINATION BURDENS RANK:



*In block groups considered, this ranking occurred most frequently. Data Source: ART Bay Area Regional Community Vulnerability Indicators, BCDC (2018).



Hazardous cleanup activities
 Groundwater threats
 Hazardous waste facilities
 Impaired water bodies

Berkeley • For the purposes of this report, 3 block groups were assigned to a functional community called "Berkeley." The block groups that were assessed can be referenced in the appendix. This is a placeholder designation for a set of block groups that have a moderate, high, or highest social vulnerability ranking within the Berkeley area. We have provided some history and context for these areas, primarily gathered via desktop research, and in some cases stakeholder and community vetting. This should be considered a starting point. Before this is used for any planning purposes, this data should be ground-truthed and vetted with the communities considered. Similarly, block groups or communities with a similar vulnerability rank could and likely will have very different needs, considerations, and capacities that are critical to bring into the planning process.

Three block groups are considered moderate or high social vulnerability. Four social vulnerability characteristics are exhibited in at least one block group in the 90th percentile, with five characteristics in the 70th percentile in the region (Figure 6g):

SOCIAL VULNERABILITY PERCENTILES IN BERKELEY

90th percentile

70th percentile

Figure 6g. Social Vulnerability Characteristics: In block groups considered for Berkeley, 4 characteristics are within the 90th percentile and 5 are within the 70th percentile in the region.



SOCIAL VULNERABILITY RANK:



GENTRIFICATION AND DISPLACEMENT RISK:



*In block groups considered, this ranking occurred most frequently. Data Source: ART Bay Area Regional Community Vulnerability Indicators, BCDC (2018).



- Low income Without a vehicle Under 5 Renters
- Not U.S. Citizens
 Single parent households
 Without a high school degree
 Severely housing cost burdened
 65 and over living alone



In this section, social vulnerability was used as the starting place for analysis. Contamination burden was assessed only for the block groups included in the functional community groupings. This means that there could be block groups that score in the moderate, high, or highest for contamination burden that were not also in the designated functional community grouping that were not considered. In short, we only look at areas that have contamination burden if they are also ranked as socially vulnerable.

Five contamination burdens are exhibited in at least one block group in the 90th percentile (Figure 7g).

CONTAMINATION BURDEN PERCENTILES IN BERKELEY



CONTAMINATION BURDENS RANK:



*In block groups considered, this ranking occurred most frequently. Data Source: ART Bay Area Regional Community Vulnerability Indicators, BCDC (2018).



Solid waste facilities
 Hazardous cleanup activities
 Groundwater threats
 Hazardous waste facilities
 Impaired water bodies

VULNERABLE COMMUNITIES

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Emeryville • For the purposes of this report, 3 block groups were assigned to a functional community called "Emeryville." The block groups that were assessed can be referenced in the appendix. This is a placeholder designation for a set of block groups that have a moderate, high, or highest social vulnerability ranking within the Emeryville area. We have provided some history and context for these areas, primarily gathered via desktop research, and in some cases stakeholder and community vetting. This should be considered a starting point. Before this is used for any planning purposes, this data should be ground-truthed and vetted with the communities considered. Similarly, block groups or communities with a similar vulnerability rank could and likely will have very different needs, considerations, and capacities that are critical to bring into the planning process.

Three block groups are considered moderate or high social vulnerability. Four social vulnerability characteristics are exhibited in at least one block group in the 90th percentile, with five characteristics in the 70th percentile in the region (Figure 8g).

SOCIAL VULNERABILITY PERCENTILES IN EMERYVILLE

90th percentile

70th percentile

Figure 8g. Social Vulnerability Characteristics: In block groups considered for Emeryville, 4 characteristics are within the 90th percentile and 5 are within the 70th percentile in the region.



SOCIAL VULNERABILITY RANK:



GENTRIFICATION AND DISPLACEMENT RISK:

- Moderate High Income -Not Losing Low Income Households
- At Risk of Gentrification and/or Displacement *
 - Ongoing Gentrification and/or Displacement

*In block groups considered, this ranking occurred most frequently.

Data Source: ART Bay Area Regional Community Vulnerability Indicators, BCDC (2018).



- Without a vehicle People with disability Severely housing cost burdened 65 and over living alone
- Low income Not U.S. citizens
 Limited English Proficiency
 Under 5
 Renters



In this section, social vulnerability was used as the starting place for analysis. Contamination burden was assessed only for the block groups included in the functional community groupings. This means that there could be block groups that score in the moderate, high, or highest for contamination burden that were not also in the designated functional community grouping that were not considered. In short, we only look at areas that have contamination burden if they are also ranked as socially vulnerable.

Three contamination burdens are exhibited in at least one block group at in the 90th percentile, with two contamination burdens in the 70th percentile in the region (Figure 9g).

CONTAMINATION BURDEN PERCENTILES IN EMERYVILLE

90th percentile ••••••••••••••••••••••••••••••••••••	••••		••	Hazardous clea Groundwater th Hazardous was
Figure 9g. Contamination		•	••	Solid waste fac
Burdens: In block groups considered for Emeryville, 3 contamination burdens are within the 90th percentile and 2 are in the 70th percentile in the region.				

CONTAMINATION **BURDENS RANK:**



*In block groups considered, this ranking occurred most frequently.

Data Source: ART Bay Area Regional Community Vulnerability Indicators, BCDC (2018).



anup activities hreats ste facilities

cilities bodies

EXPOSURE OF CRITICAL SERVICES AND FACILITIES IN IRON TRIANGLE / CENTRAL RICHMOND, RICHMOND ANNEX / EL CERRITO, BERKELEY AND EMERYVILLE COMMUNITIES

Critical services and facilities that provide education, community cohesion, and emergency services, and sanitation will also be impacted by flooding. Table 1g provides details on critical services potentially at risk of flooding within the communities of Iron Triangle/Central Richmond, Richmond Annex/ El Cerrito, Berkeley, and Emeryville. First minor impacts of exposure of assessed critical facilities begins at 36" TWL where access roads are impacted. Greater impacts to critical facilities and services begins at 52" TWL and increase through 108" TWL.

Total water levels (TWLs) are used to represent various combinations of temporary and/or permanent flooding that may occur with future sea level rise. Values in the table reflect potential risks to critical facilities in the absence of adaptation planning.



	Critical Facilities/Services Impacted	12"	24"	36"	48"	52"	66"	77"	84"	96"	108"
	John Henry High School (Marina Way, Richmond)			Μ	Μ	Μ	Μ				
	Benito Juarez Elementary School (Marina Way, Richmond)			Μ	Μ	М	Μ				
	Richmond Charter Academy (Marina Way, Richmond)			М	Μ	М	Μ				
Schools	Washington Elementary School (Martin Luther King Jr Way, Berkeley)										
	GO Public School WCC (Marina Way, Richmond)										
	Western Contra Costa School District (Potrero Avenue, Richmond)										
	Manzanita Middle School (Carlson Boulevard, Richmond)										
aith	Church of Living God (S. 4th Street, Richmond)										
ces of Fa	Mt. Carmel Missionary Baptist (S. 15th Street, Richmond)										
Plac	Great Commission Christian Church (Carlson Blvd, Richmond)										
itals	Kaiser Permanente School of Allied Health Sciences (Marina Way, Richmond)						•				
Hosp	BAART Richmond Community Clinic(Cutting Boulevard, Richmond)									•	
Fire s	Richmond Police Department (Regatta Boulevard, Richmond)							М	Μ		
ice and Station	Richmond Fire Department Station 67 (Cutting Boulevard, Richmond										
Pol	Richmond Fire Department Station 64 (Bayview Avenue, Richmond)										
	South 8th St & Virginia Ave Regulation Gas Station (Cutting Boulevard and Harbour Way)							$\mathbf{\dot{\cdot}}$			
s	Natural gas pipelines (throughout)							$\overline{\mathbf{O}}$			
Utilitie	Virginia Substation (11th Street, Richmond)								F		
	Electrical Transmission Lines (throughout)								4		
	East Bay Municipal Utilities District Point Isabel Wet Weather Treatment Plant (Isabel Street)										

Table 1g. Critical Services and Facilities: First exposure of critical services and facilities. "M" refers to minor impacts such as impacts to access roads. Blue bars represent when asset is first exposed to flooding.

West Oakland • For the purposes of this report, 12 block groups were assigned to a functional community called "West Oakland." This community overlaps the border of the San Leandro and East Bay Crescent OLUs. The block groups that were assessed can be referenced in the appendix. This is a placeholder designation for a set of block groups that have a moderate, high, or highest social vulnerability ranking within the West Oakland area. We have provided some history and context for these areas, primarily gathered via desktop research, and in some cases stakeholder and community vetting. This should be considered a starting point. Before this is used for any planning purposes, this data should be ground-truthed and vetted with the communities considered. Similarly, block groups or communities with a similar vulnerability rank could and likely will have very different needs, considerations, and capacities that are critical to bring into the planning process.

The following seven social vulnerability characteristics are exhibited in at least one block group in the 90th percentile, with four in the 70th percentile in the region (Figure 10g).

SOCIAL VULNERABILITY PERCENTILES IN WEST OAKLAND

90th percentile

70th percentile

Figure 10g. Social Vulnerability Characteristics: In block groups considered for West Oakland, 7 characteristics are within the 90th percentile and 4 are within the 70th percentile in the region.

SOCIAL VULNERABILITY RANK:



GENTRIFICATION AND DISPLACEMENT RISK:

Moderate Income - Not Losing Low Income Households

At Risk of Gentrification and/or Displacement

Ongoing Gentrification and/or Displacement *

*In block groups considered, this ranking occurred most frequently. Data Source: ART Bay Area Regional Community Vulnerability Indicators, BCDC (2018).



- Low income Without a vehicle People with disability Communities of Color Under 5 Severely housing cost burdened Renters
- Single parent households
 Limited English proficiency
 Without a high school degree
 65 and over living alone

In this assessment, we include the details for block groups that exhibit social vulnerability characteristics and are exposed to flooding in this OLU, many of which overlap with the San Leandro OLU, for areas that exhibit social vulnerability characteristics and are exposed to flooding impacts as the "West Oakland Community" This includes twelve block groups that make up parts of the neighborhoods including Clawson, McClymonds, Prescott, Lower Bottoms, Ralph Bunche, Oak Center, Cypress Village and Acorn, Old Oakland, China Town, Lakeside, Peralta-Laney, and Acorn Industrial. In this description, we acknowledge that we are not members of the community and thus we cannot speak on behalf of the lived experiences of its residents. Our intent is to elevate this community as part of the region's interconnected systems and use this description to help set a sense of place.

West Oakland contains areas of mixed residential and light industrial uses, including rail yards and the Port of Oakland. Goods from the Port of Oakland are moved primarily by diesel trucks, which cause air quality problems in the West Oakland communities as well as increased traffic congestion on regional freeways. Additionally, the community is adjacent to many major freeways, including the I-880, I-980 and I-580, contributing to the poor air quality and health issues in this area. The I-880, also known as the Cypress Freeway, divides neighborhoods and separated the community from Downtown Oakland. This area also has had a lack of a grocery store for decades and high unemployment rates.

The communities of West Oakland are exposed to some of the highest levels of air pollution in the Bay area and a 2008 California Air Resources Board (CARB) study found that West Oakland residents are exposed to diesel air pollution at a rate of nearly three times greater than average for the Bay Area. Heavy industrial pollution from the Port of Oakland and associated activities, including the East Bay Municipal Utilities District (EBMUD) main wastewater treatment plant, among others. Goods from the Port of Oakland are moved primarily by diesel trucks, which cause air quality problems in the West Oakland communities as well as increased traffic congestion on regional freeways. Additionally, the community is adjacent to many major freeways, including the I-880, I-980 and I-580, contributing to the poor air quality and health issues in this area. The I-880, also known as the Cypress Freeway, divides neighborhoods and separates the community from Downtown Oakland.

*Note: This community spans the border between the East Bay Crescent OLU and San Leandro OLU. The community descriptions are the same in both Local Assessments, even though block groups cross OLU boundaries. The Focus Area in this Local Assessment will discuss impacts where flooding occurs from overtopping in this OLU. Please see the San Leandro OLU for details on flooding and overtopping that occur from the San Leandro OLU. The presence of contaminated lands is also a significant area of concern, particularly in places where sites are exposed to flooding. Within the West Oakland community, there are multiple contaminated sites, including sites listed by the California Department of Toxic Substances Control (DTSC), California Water Quality Control Boards Groundwater Threats, and Leaking Underground Storage Tanks. Additionally, there is a federally listed Superfund site called "AMCO Chemical" located adjacent to the community.²² Within the West Oakland community, there are also high percentages of contamination vulnerability. The communities

of West Oakland are exposed to some of the highest levels of air pollution in the Bay area and a 2008 California Air Resources Board (CARB) study found that West Oakland residents are exposed to diesel air pollution at a rate of nearly three times greater than average for the Bay Area. Heavy industrial pollution from the Port of Oakland and associated activities, including the East Bay Municipal Utilities District (EBMUD) main wastewater treatment plant, among others.

The following four contamination burdens are exhibited in at least one block group at in the 90th percentile, and one in the 70th percentile in the region (Figure 11g).

CONTAMINATION BURDEN PERCENTILES IN WEST OAKLAND



CONTAMINATION BURDENS RANK:

Х	Low
Χ	Moderate
Χ	High *
Χ	Highest *

*In block groups considered, this ranking occurred most frequently.

Data Source: ART Bay Area Regional Community Vulnerability Indicators, BCDC (2018).



 Hazardous cleanup activities Groundwater threats Hazardous waste facilities Solid waste facilities

Impaired water bodies

Residential households in the West Oakland community begin to be impacted by significant flooding starting at 52" TWL, where a threshold occurs from overtopping of shoreline protection structures south of the San Francisco – Oakland Bay Bridge touchdown as well as from embankment underneath the Macarthur Maze junction leads to significant flooding of the West Oakland community.

Critical services and facilities that provide education, community cohesion, and emergency services, and sanitation will also be impacted by flooding. Table 2g provides details on critical services potentially at risk of flooding within the communities of West Oakland. Flooding impacts begin at 52" TWL and increase through 108" TWL.

Total water levels (TWLs) are used to represent various combinations of temporary and/or permanent flooding that may occur with future sea level rise. Values in the table reflect potential risks to critical facilities in the absence of adaptation planning.

	Critical Facilities/Services Impacted	12"	24"	36"	48"	52"	66"	77"	84"	96"	108"
sloc	Vincent Academy (Chestnut Street, Oakland)										
Scho	Ralph J. Bunche Academy (18th Street, Oakland)										
	Greater Galilee Church In (Adeline Street , Oakland)										
of Faith	Vacation Bible School (Adeline Street, Oak- land)										
Places	Community Christian Church (34th Street, Oakland)										
	The Life Church (Peralta Street, Oakland)								(jj)		
	EBMUD Wastewater Treatment Facility (WWTF) (Wake Ave, Oakland)										
Utilitie	Natural Gas Pipelines (throughout)					$\mathbf{\dot{e}}$					
	Electrical Transmission Lines (throughout)					F					
ste	California Waste Solutions, Medium Volume Transfer/Processing Facility (Wood Street)										
Wa:	California Waste Solutions, Large Volume Transfer/Processing Facility (10th Street)										

EXPOSURE OF CRITICAL SERVICES AND FACILITIES IN THE WEST OAKLAND COMMUNITY

 Table 2g. Critical Services and Facilities: First exposure of critical services and facilities. Blue bars represent

 when asset is first exposed to flooding. Please note, the West Oakland Community spans the border of this OLU

 and the San Leandro OLU.

PRIORITY DEVELOPMENT AREAS (PDAS)



Richmond. Imagery courtesy Google Earth

T PRIORITY DEVELOPMENT AREA

South Richmond PDA • Located within the City of Richmond, the South Richmond PDA extends from Ohio Avenue to the north to Marina Bay to the south and South 8th Street to the west and South 23rd the east, and then extends southeast along I-580 to Central Avenue. This PDA is a 1,099-net acre area designated as a Transit Neighborhood²³ that includes the areas of Point Isabel Regional Shoreline, Marina Bay and Coronado community in Richmond, as well as parts of the Port of Richmond. It is served by numerous transportation services including three nearby BART stations (though all are outside the PDA boundaries), AC Transit, Golden Gate Transit, Bear Transit (UC Berkeley's bus service), and Amtrak/Capital Corridor train service. A new ferry terminal was recently built in the area that provides ferry service from Richmond to San Francisco.

This area contained the largest wartime shipbuilding operations on the West Coast during World War II, and these shipyards covered much of the land along the South Richmond shoreline on land that was previously former marsh tidelands.²⁴ Today, the area is largely characterized by intense industrial and port uses, with plans for redevelopment to occur within the next several decades. This PDA overlaps with the Port of Richmond and is located near the Chevron Refinery. Due to its history of industrial land uses, this PDA includes numerous contaminated sites, including one current and one formally federally listed superfund sites, as well as multiple brownfield sites. Cleanup has occurred at various portions of the site. This PDA also includes various tidal wetland marshes which provide habitat for endangered species.

CURRENT AND FUTURE HOUSING AND JOBS IN THE SOUTH RICHMOND PDA

The South Richmond Bay Specific Plan calls for the development of the site into a residential area with single-family homes, apartments, senior housing and childcare centers.²⁵

All marshes within the PDA are exposed to flooding at 12" TWL. Flooding extent increases in current open areas within this PDA until 66" TWL, when significant portions of residential households, commercial and industrial areas in the PDA area are exposed to flooding.

Critical facilities that provide emergency services and utilities may be impacted by flooding. Table 3g provides details on what critical facilities may be at risk. First impacts begin at 66" TWL and increase through 108" TWL.

EXPOSURE OF CRITICAL FACILITIES IN THE SOUTH RICHMOND PDA



Existing in 2010: 3,199 Projections for 2040: 7,725 Percent Growth: 141.5%



Existing in 2010:	5,747
Projections for 2040:	24,200
Percent Growth:	321.1%

Data Source: Plan Bay Area 2040, MTC/ABAG (2017).

	Critical Facilities/Services Impacted	12"	24"	36"	48"	52"	66"	77"	84"	96"	108"
e/Fire	Richmond Police Department (Regatta Boulevard, Richmond)							Μ			
Polic	Richmond Fire Department Station 67 (Cut- ting Boulevard, Richmond)										
	South 8th St & Virgina Ave Regulation Gas Station (Cutting Boulevard and Harbour Way, Richmond)						\bigcirc				
	Natural Gas Pipelines (throughout)						\bigcirc				
ties	Virginia Substation (11th Street, Richmond)							F			
Ctili	Electrical Transmission Lines (throughout)							F			
	Point Isabel Wet Weather Facility (PIWWF) (Isabel Street, Richmond)						Μ	М			
	East Bay Municipal Utilities District Point Isabel Wet Weather Treatment Plant (Isabel Street, Richmond)										

Table 3g. Critical Services and Facilities: First exposure of critical services and facilities. "M" refers to minor impacts or impacts to access roads. Blue bars represent when asset is first exposed to flooding.



Housing units in Emeryville. Photo by Thomas Hawke.

Mixed-Use Core (Emeryville) PDA •

Covering nearly the entire City of Emeryville, this PDA extends from the City boundaries north of 67th Street to the north, Doyle Street to the east, including portions of San Pablo Avenue, and I-80/I-580 to the west. The Mixed-Use Core PDA is a 451-net acre area designated as a City Center.²⁶ It is served by the Emery Go-Round Shuttle bus to BART, AC Transit and includes an Amtrak/Capital Corridor Station in Emeryville.

This area is a former industrial and warehouse city that has been redeveloped into a hub for light industrial, research and development, and retail space. Emeryville has been a significant job creator for the East Bay due to its location and regional accessibility, as well as proximity to the University of Berkeley and other major corporations, and the majority of current land uses today are commercial or industrial, with under a quarter residential housing and some areas of public use, open space, and mixed-use. Future plans for the PDA include an emphasis on residential development, including mixed-use with residential and high-density residential.

CURRENT AND FUTURE HOUSING AND JOBS IN MIXED-USE CORE (EMERYVILLE) PDA



Data Source: Plan Bay Area 2040, MTC/ABAG (2017).



Due to its history of heavy industrial uses, there are numerous contaminated sites in this PDA exposed to flooding.

The wetlands in front of the PDA in the Emeryville Crescent are exposed beginning at 12" TWL, while the PDA itself is exposed at 52" TWL, when significant areas are flooded from several areas of overtopping. Another flooding threshold occurs at 77" TWL from increased flooding and additional overtopping at Temescal Creek.

Critical facilities that provide emergency services and waste facilities may be impacted by flooding. Table 4g provides details on what critical facilities may be at risk. First impacts begin at 52" TWL and increase through 108" TWL.

EXPOSURE OF CRITICAL SERVICES AND FACILITIES IN MIXED-USE CORE (EMERYVILLE) PDA

	Critical Facilities/Services Impacted	12"	24"	36"	48"	52"	66"	77"	84"	96"	108"
ē	Emeryville Fire Department Station 1 Head- quarters (Powell Street, Emeryville)ª					М	М	Μ			
olice/Fir	Emeryville Police Department (Powell Street, Emeryville)ª					Μ	Μ	Μ	Μ	0	
Ā	Emeryville Fire Department Station 2 (Hollis Street, Emeryville)										Μ
Waste	Contaminated Sites (throughout)										

Table 4g. Critical Services and Facilities: First exposure of critical services and facilities. "M" refers to minor impacts or impacts to access roads. ^a refers to assets outside PDA boundaries but provide critical services to PDA. Blue bars represent when asset is first exposed to flooding. Colored bars represent when asset is first exposed to flooding.

PRIORITY CONSERVATION AREAS (PCAS)





San Francisco Bay Trail in Richmond. Map data @2019 by Google.

San Francisco Bay Trail PCA • The San

Francisco Bay Trail is a 500-mile regional trail that, upon completion, will circumnavigate the bay. The trail connects people and communities to each other, to parks and open space, to home, work and recreation, and to countless areas of cultural and historic interest. It provides opportunities for health and fitness, increased transportation options, opportunities to observe, learn about, and care for the environment, and provides economic benefits to the region through increased tourism.²⁷

Within this OLU, the Bay Trail is present in two main corridors, the first running adjacent to the bay shoreline and connecting commuters from Richmond to Emeryville and Oakland, and the second running inland along the Ohlone Greenway, connecting Richmond to areas of El Cerrito, Albany and Berkeley. The Bay Trail in this area is used to connect commuters across the region as well as provide recreation access to numerous inland and shoreline

PCA DESIGNATION:



FUNCTIONS/BENEFITS:

- Recreation
- Community Health
- Transportation
- Economic Development
- Environmental Stewardship

Data Source: MTC/ABAG Priority Conservation Areas Program (2017).

J.



recreation areas, including Point Isabel Regional Shoreline, Cesar E. Chavez Park, and McLaughlin Eastshore State Seashore park. There are 31 miles of existing (27.7 miles) and proposed (3.3 miles) Bay Trail routes split into 64 segments. The Bay Trail becomes exposed to flooding beginning at 12" TWL and increases slowly through 36" TWL. By 48" TWL, the first threshold occurs, and significant flooding is seen. By 66" TWL, a second threshold is crossed an even greater amount of Bay Trail becomes exposed.

San Francisco Bay Water Trail Sites

PCA • The San Francisco Bay Area Water Trail is a network of launching and landings sites for non-motorized watercrafts (e.g. kayaks, stand-up paddleboards, wind and kite surf, etc.) around the San Francisco Bay and its major tributaries, including the San Joaquin River, Napa River, and Petaluma River.²⁸

Within this OLU, there are eight official Water Trail sites.²⁹ These include the Boat Ramp Street Launch Area, Marina Bay Yacht Harbor, Vincent Park, Shimada Friendship Park, Albany Beach, two sites at the Berkeley Marina, and the Emeryville Marina. The sites range from boat ramps and marinas to beaches. Beach sites are more vulnerable to flooding impacts than marinas and harbor sites because beaches exist on the shoreline and cannot accommodate much increase in water levels. The two beach sites in this OLU (Vincent Park and Albany Beach) are impacted by flooding beginning

PCA DESIGNATION:



FUNCTIONS/BENEFITS:

- Recreation
- Wildlife Habitat
- Economic Development

Data Source: MTC/ABAG Priority Conservation Areas Program (2017).

at 12" TWL. Other sites that have docks may be able to keep up with rising water levels; however, in these cases, impacts to access roads and parking facilities may limit the ability to use these sites. The Boat Street Ramp in Richmond is impacted at 36" TWL when access roads and parking are inaccessible. Additional Water Trail sites are impacted from 48" TWL to 77" TWL when access roads and parking are flooded at these sites.

Regional Trail System Gap PCA • The

Regional Trail Systems Gaps PCA is an effort by East Bay Regional Park District (EBRPD) to close gaps in the regional trails systems in the East Bay.

Within this OLU, it is located in three areas: the northern section of the OLU at Point Richmond, near the Port of Richmond (exposed at 52" TWL from overtopping of a shoreline protection structure); the middle section near Golden Gate Fields in Albany within and adjacent to the I-580, I-80 and Bay Trail (exposed to flooding at 36" TWL from overtopping of shoreline protection and transportation structures); and in the southern section near the Port of Oakland running along I-80 and parallel to sections completed in 1995 and 2005-2006 (exposed at 52" TWL from overtopping of wetlands).

PCA DESIGNATION:



FUNCTIONS/BENEFITS:

- Recreation
- Terrestrial Ecosystems
- Aquatic Ecosystems
- Water Supply and Quality

Data Source: MTC/ABAG Priority Conservation Areas Program (2017).

PCA DESIGNATION:



FUNCTIONS/BENEFITS:

- Recreation
- Wildlife Habitat
- Community Health
- Water Supply and Quality
- Climate and Resilience

Data Source: MTC/ABAG Priority Conservation Areas Program (2017).

Cerrito Creek PCA • The Cerrito Creek PCA is a 4-acre area that encompasses lower Cerrito Creek from the Ohlone Greenway to the City of El Cerrito's western boundary with Richmond. It is managed by partnerships with the City of El Cerrito, City of Albany and Friends of Five Creeks. The Cerrito Creek represents an important riparian corridor that separates Alameda and Contra Costa counties and supports a habitat refuge connected to the adjacent areas of Albany Hill and Creekside park.³⁰

The Cerrito Creek PCA is unique as it provides a wilderness area with native plants, butterflies, moths, and riparian habitat among a highly urbanized environment. Paths within and adjacent to the PCA provide alternatives to driving and promote pedestrians and bicyclists.



The Cerrito Creek PCA is first exposed to flooding at 36" TWL and water continues to rise within the creek banks with increasing total water levels. At 77" TWL a threshold occurs, and the Creek embankments overtop, leading to significant flooding of nearby residential households.

There are many ecosystem services of the Cerrito Creek PCA including providing recreation, stormwater services of runoff retention, groundwater recharge, and flood water retention (Figure 12g).

ECOSYSTEM SERVICES OF CERRITO CREEK PCA



Figure 12g. Ecosystem Services of PCAs. Statistics on habitats, recreation, carbon storage and stormwater retention in PCAs. Data by the ART Bay Area Natural Capital Project (2019).

Potential Oakland Gateway PCA • This proposed 45 to 170-acre PCA would be a major new shoreline park located at the touchdown of the I-80 San Francisco-Oakland Bay Bridge.³¹ The proposed area has been part of plans by nine agencies to develop the shoreline area into a major shoreline park destination.³² The area currently includes hiking and bike trails along the eastern half of the I-80 San Francisco-Oakland Bay Bridge. The lead agency for this proposed PCA is the East Bay Regional Parks District, in coordination with Caltrans, who owns the property, and the Bay Area Toll Authority, who has provided funding for marsh restoration as well as potential amenities including bathrooms and a commercial kitchen. If completed, this area would become part of the larger Oakland Greening PCA. It is exposed beginning at 12" TWL.

There are many ecosystem services of the Potential Oakland Gateway PCA including providing habitat, recreation, stormwater services of runoff retention, groundwater recharge, and flood water retention (Figure 13g).

PCA DESIGNATION:



FUNCTIONS/BENEFITS:

- Recreation
- Terrestrial Ecosystems
- Aquatic Ecosystems
- Water Supply and Quality

Data Source: MTC/ABAG Priority Conservation Areas Program (2017).

ECOSYSTEM SERVICES OF POTENTIAL OAKLAND GATEWAY PCA



Figure 13g. Ecosystem Services of PCAs. Statistics on habitats, recreation, carbon storage and stormwater retention in PCAs. Data by the ART Bay Area Natural Capital Project (2019).

Oakland Priority Creeks PCA • This

PCA encompasses creeks throughout the City of Oakland. Within this OLU, creeks included in the PCA are present just north of the I-80 San Francisco-Oakland Bay Bridge within the Potential Oakland Gateway Area PCA. All creeks in this OLU are open creeks, which are defined as waterways in the city of Oakland that have been designated as creeks.

The designation is meant to protect streams identified, help make conservation targets under the Conservation Lands Network, support watershed health, protect downstream water uses by protecting creek health, protect critical riparian ecosystems and the diversity of animals that use those creeks for corridors, increase urban tree cover in areas expected to experience urban heat island effects, support local urban greening initiatives, and increase areas with carbon storage potential. The creeks are exposed to flooding at 12" TWL.

PCA DESIGNATION:



FUNCTIONS/BENEFITS:

- Recreation
- Community Health
- Terrestrial Ecosystems
- Aquatic Ecosystems
- Water Supply and Quality
- Climate and Resilience

Data Source: MTC/ABAG Priority Conservation Areas Program (2017).



G - 37 • ADAPTING TO RISING TIDES: BAY AREA

Focus Area A: *South Richmond*



Location

This Focus Area includes areas in the City of Richmond, including the Port of Richmond, South Richmond shoreline, including Marina Bay, Southwest Annex and Point Isabel Regional Shoreline park. It is bounded by the Port of Richmond (west), Nevin Avenue (north), I-80 (east) and Central Avenue (south). It is approximately 5.18 square miles (Figure 14g).



Figure 14g. Top: Identification of where focus area is within OLU. Bottom: Map of focus area containing regional systems. Individual assets assessed in this focus area are labeled on the map and listed on the following page.



South Richmond shoreline. Map data ©2019 by Google.

Why shared stories of vulnerability?

This Focus Area was selected because it contains a variety of regional systems, including numerous transportation routes, a priority development area, multiple priority conservation areas, and the Richmond community.

Due to overlap and dependencies among these regional systems in this area, the vulnerabilities of these systems to flooding and sea level rise are discussed together in shared stories of the shoreline, overtopping, and exposure to flooding as water levels rise. By communicating shared vulnerabilities and consequences, our goal is to encourage multi-benefit solutions that help people, ecosystems, and economies.

Figure 14g. MAP OF REGIONAL SYSTEMS AND LIST OF INDIVIDUAL ASSETS ASSESSED WITHIN THIS FOCUS AREA LISTED BELOW:



TRANSPORTATION

- Port of Richmond
- I-580
- I-80
- Union Pacific Railroad Richmond/ El
- Burlington-Northern Santa Fe Railroad
- Richmond Pacific Railroad



VULNERABLE COMMUNITIES

- Iron Triangle/ Central Richmond
- Richmond/ El Cerrito



PRIORITY DEVELOPMENT AREAS (PDAs)

• South Richmond PDA



PRIORITY CONSERVATION AREAS (PCAs)

- San Francisco Bay Trail PCA
- San Francisco Bay Water Trail (4) PCA
- Regional Trail System Gaps PCA

Shoreline today and into the future

SHORELINE TYPE STORY

SHORELINE *What is the shoreline made up of now?*

The majority of the shoreline in this Focus Area are made up of shoreline protection structures, largely around the Port of Richmond, including the areas of Santa Fe and Harbor Channel, as well as across most of the South Richmond shoreline, including the

shoreline surrounding Inner Harbor Basin.³³

In one small section on the west side of the Port of Richmond in the Harbor Channel, there is a stretch of natural shoreline and embankment. Additionally, a berm extends into the Bay from Vincent Park in Marina Bay. East of Marina Bay, the shoreline is made up of berms and wetlands of Stege Marsh (also known as the South Richmond Marshes), Meeker Slough and Hoffman Marsh, natural shorelines, and embankments.

There is a shoreline protection structure in front of the wetlands that are bayside to business and light industrial land use areas, including the former federally listed Superfund site, "Liquid Gold," also known as the Zeneca site. There are embankments that extend further inland, as well as the I-80 which serves as a transportation protection structure.

SHORELINE DEVELOPMENT STORY

How will the shoreline change in the future?

This area is actively undergoing significant development activities, particularly along the South Richmond Shoreline, which is a Priority Development Area and being planned for increased housing and

mixed-use development. There are also numbers activities that have recently been permitted by BCDC or have ongoing permit applications in progress. These major potential shoreline changes include:

- Port of Richmond Ferry Terminal 1 (permitted by BCDC July 2019)
- Point Richmond Redevelopment Proposal (ongoing at time of publication)
- **Remediation Proposal for South Richmond Development**, including at the Zeneca site (ongoing at time of publication)





G - 41 • ADAPTING TO RISING TIDES: BAY AREA

Current and future flooding risk

OVERTOPPING STORY

Where is water coming over the shoreline?

Overtopping of the berms near Vincent Park and in wetlands east of Marina Bay occurs at 12" TWL, as well as overtopping of protection structures near the Inner Harbor Basin, and along the Harbor Channel and Lauritzen Canal at the Port of Richmond. At 24" TWL,

overtopping in these areas extend along the shoreline.

At 36" TWL, overtopping at the Port of Richmond at the Lauritzen Canal leads to minor flooding, with additional overtopping of embankments in Richmond Annex, and by 48" TWL, there is widespread overtopping around Inner Harbor Basin and Port of Richmond in the Santa Fe Channel (Figure 15g). At 66" TWL, widespread overtopping along the shoreline continues and by 77" TWL, new overtopping occurs at Point Isabel Regional Park, as well as additional embankments near the wetlands and almost the entirety of the Port of Richmond shoreline. Overtopping continues as waters rise.

FLOODING EXPOSURE STORY

Where does flooding occur?

The wetlands of Stege Marsh (also known as the South Richmond Marshes), Meeker Slough and the Hoffman Marsh are within or adjacent to the South Richmond PDA and flooded at 12" TWL (Figure 16g). By 24" TWL, overtopping at the northeastern corner of

the Inner Harbor Basin leads to minor flooding at Marina Park.

At 36" TWL, overtopping at the Port of Richmond leads to flooding of local access roads, including Cutting Boulevard and South 4th Street. Flooding also occurs in open space areas near the Bayview Avenue onramp to I-580. By 48" TWL, flooding significantly increases from overtopping at the Port of Richmond, impacting numerous roads and business/light industrial areas just south of Atchinson Village. Flooding impacts also become significant east of the I-580, impacting residential households in the Richmond Community. Flooding also impacts business/light industrial areas near Bayview Avenue, including those at Seaport Avenue and South 51st Street.

At 66" TWL, another flooding threshold occurs as additional areas become flooded, including significant areas south of I-580 around the Port of Richmond, in south Richmond areas zoned for business/light industrial, and medium density mixed-use residential. Flooding increase from 77" to 108" TWL, where flooding impacts residential homes, businesses, public institutions, schools and portions of the Richmond communities. Flooding extent continues as waters rise.



36" TWL

OVERTOPPING AND FLOODING

Figure 15g. Two total water levels selected that demonstrate first overtopping and/or significant flooding thresholds. Visit the Bay Shoreline Flood Explorer (explorer.adaptingtorisingtides.org) to see more TWLs.

48" TWL



FIRST FLOODING OF REGIONAL SYSTEMS ASSESSED

Regional Systems Impacted	12"	24"	36"	48"	52"	66"	77"	84"	96"	108"
South Richmond PDA (wetlands)										
San Francisco Bay Trail PCA	Ť									
San Francisco Water Trail PCA	Ť									
Richmond Pacific Railroad										
Port of Richmond			•							
Union Pacific Railroad			•							
Local Roads			•							
I-80			•							
I-580			•							
Richmond Community			•	ttt						
Regional Trail System Gaps PCA			•		<u>ب</u>					
Burlington-Northern Railroad			•							

Figure 16g. First exposure of regional systems. Individual assets within the four regional systems in this area are shown and colored bars represent when each asset is first exposed to flooding impacts.

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Shared vulnerabilities to flooding

SHARED VULNERABILITY STORIES

Vulnerability assessments were conducted on individual assets and then shared vulnerabilities were identified for regional systems within each focus area. The vulnerability statements below reflect shared stories of vulnerability. Our goal is to emphasize the interconnections among and across local systems, and encourage shared multi-benefits adaptation solutions.

1. Richmond Community Vulnerable Populations Housing and Jobs

Richmond supports housing and community services for vulnerable populations in the area and is exposed to flooding. Many of the homes in the Iron Triangle/Central Richmond community consist of older and aging homes that are more vulnerable to flooding impacts. Impacts affect communities in the South Richmond Annex and residential households in the Santa Fe, Atchison Village and Iron Triangle neighborhoods. Adjacent to this community is also the South Richmond PDA, an area designated for significant future jobs and housing growth. The communities, housing and jobs at risk of flooding are dependent on the Port of Richmond for shoreline flood protection, as well as from the Stege Marsh and Meeker Slough wetlands. The Richmond community also depends on the railroad tracks, owned by a variety of owners and managers, that serve as ad-hoc flood protection. This community has already experienced historic issues with unemployment, housing affordability, and hazardous land contamination and flooding will only exacerbate existing social and economic challenges.

2. Future Development Growth and Contamination



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The South Richmond PDA is planning for significant future growth, particularly around the South Richmond shoreline. This area in the South Richmond PDA also has a history of contaminated lands from its history industrial land uses, which may mobilize in the event of flooding leading to public and environmental health hazards. Future remediation efforts in places planned for future residential households and mixed-use development should ensure that hazardous material will be secured in the event of flooding from storms or sea level rise.



Homes along the shoreline of South Richmond. Photo by BCDC.

3. Movement of People and Goods in Communities and the Port of Richmond

The Port of Richmond handles the majority of bulk liquid movement in the Bay Area. It is connected to other ports and regions through regional rail and freeways. The Port floods due to overtopping and rising groundwater, damaging infrastructure necessary for Port operations. The Port is also indirectly vulnerable due to flooding of rail and local roads that move goods to and from the Port. There is a lack of redundancy of Seaports in the San Francisco Bay Area, and limited opportunity to accommodate the Port's specialized cargo services.

4. Wetlands and Regional Recreation and Commuting

The San Francisco Bay Trail runs along the length of the shoreline and through various wetland areas including Stege Marsh and Meeker Slough. This area is used by both residents and visitors for recreation and commuting from job centers along the East Bay. The Bay Trail in this area also connects to various Water Trail sites, which provide free, public access to the Bay. The wetlands and Bay trail are among the first systems impacted by flooding in this area and disruptions to these systems will impact the ecosystem services provided by wetlands, including their recreational value.











Shared consequences to flooding

SHARED CONSEQUENCE STORIES

This section translates shared vulnerability statements into stories of shared consequences. The ART program considers consequences through frames of sustainability: Society and Equity, the Economy and the Environment.

Society and Equity • The Bay Trail, a publicly accessible commuter and recreation route, has segments exposed to flooding early. Because the Bay Trail functions as an interconnected system, disruptions at any segments can limit and disrupt its use for commuters and visitors who may use the route to access employment in Richmond and from other areas including the cities of Emeryville, Albany, Berkeley and Oakland. The Bay Trail also serves to connect users to other recreation areas such as the Point Isabel Regional park.

This area includes the Richmond community, which has among the highest social vulnerability in the region, as well as some of the highest contamination burdens. Flooding impacts in these communities are likely to disproportionately impacts residents who possess characteristics that may make it more difficult to respond to, or plan for, flood events. Residents in the Iron Triangle/Central Richmond community exhibit all twelve social vulnerability characteristics, with eleven in the 90th percentile for the region. Disruptions to critical services, such as fire and police stations, as well as impacts to the community clinic will also impact community member's ability to access emergency and care services. The presence of contaminated sites and lands here also pose potential hazards to people in this area.



G - 46 • ADAPTING TO RISING TIDES: BAY AREA

Economy • The Port of Richmond provides significant services to the regional economy as it handles large amount of liquid bulk, including oil and petroleum, which are critical for the region. Disruptions to port access, including local routes, railroad track and flooding of the I-580 is likely to have significant economic consequences both locally and regionally. Two substations in this area are also impacted, and likely to affect electrical supply to local homes, businesses, the Port and emergency and critical services.

Flooding of the I-580 is also likely to have large economic consequences as it carries high truck traffic volumes that move goods from both the Port of Richmond and the Port of Oakland and there are limited alternatives to divert this truck traffic. Additionally, I-580 carries commuters across the region and disruption will impact the ability of people to access work and other services.

Environment • The wetlands of Stege Marsh (also known as the South Richmond Marshes) and Meeker Slough in the South Richmond PDA are exposed to flooding early and constrained by both development, highways, as well as contaminated sites behind them, meaning they may be unable to migrate landward to avoid drowning as sea levels rise. The presence of contaminated lands buried under sediments in Marina Bay and in various stages of cleanup at the Zeneca site may pose human and environmental health hazards if flooding mobilizes contaminates into other areas.

San Francisco Bay Trail adjacent to the marshes of South Richmond. Photos by BCDC.



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Advancing adaptation solutions

STORY

FITTING INTO How are local areas contributing to **REGIONAL** Regional Hot Spots?

The regional scale analysis of ART Bay Area identified clusters of highest consequences around the region, called "Regional Hot Spots." These areas include places that contain the top five highest consequences

in the region for 1) any transportation asset and 2) either a PDA or PCA, and 3) the presence of a vulnerable community block group at any given water level.

Datasets were identified for each regional system to provide a measure of consequence to quantify impacts in the event of flooding. A full list of consequences used for each

Regional Hot Spot at 24" TWL PDA

Regional Hot Spot Transportation Infrastructure Vulnerable Community

regional system can be found in Chapter 2.1 **Regional Hot Spots.**

The South Richmond Focus Area is a Regional Hot Spot, meaning it contains a cluster of assets that have among the highest consequences of flooding in the region.

The South Richmond area becomes a Regional Hot Spot starting at 24" TWL, and remains a Regional Hot Spot at every total water level through 108" TWL. It is an early cluster and remains critical to the region over time (Figure 17g).

The assets driving the South Richmond cluster at 24" TWL includes the Port of Richmond, impacts to the South Richmond PDA, specifically for future job spaces (2040) and growth in job spaces, and impacts to residential housing units for several socially vulnerable and contaminated block groups.

Chapter 4 Regional Adaptation provides adaptation responses for regional issues.

Figure 17g. Richmond Hot Spot: From 24" TWL to 108" TWL, this focus area contains clusters of assets that have among the highest consequences of flooding in the region.

PCA



Top photo: Marshes of South Richmond; Bottom photo: Shoreline of South Richmond. Photos by BCDC.



Focus Area B *Emeryville, I-80 Bridge Touchdown and West Oakland*



Location

This Focus Area includes the City of Emeryville, the I-80 San Francisco-Oakland Bay Bridge touchdown, and communities in the West Oakland neighborhood, which is part of the City of Oakland. It is bounded by Ashby Avenue (north), the OLU boundary (east), portions of the Port of Oakland and West Oakland community (south) and the San Francisco Bay (west). It is approximately 4.8 square miles. (Figure 18g).



Figure 18g. Top: Identification of where focus area is within OLU. Bottom: Map of focus area containing regional systems. Individual assets assessed in this focus area are labeled on the map and listed on the following page.



I-80 Touchdown and Emeryville shoreline. Photo courtesy Google Earth Pro.

Why shared stories of vulnerability?

This Focus Area was selected because it contains a variety of regional systems, including numerous transportation routes and I-80 San Francisco-Oakland Bay Bridge touchdown, a PDA, multiple PCAs, and the West Oakland community.

Due to overlap and dependencies among these regional systems in this area, the vulnerabilities of these systems to flooding and sea level rise are discussed together in shared stories of the shoreline type, overtopping, and exposure to flooding. By communicating shared vulnerabilities and consequences, our goal is to encourage shared multi-benefit solutions to protect people, economies, and environments into the future.

Figure 18g. MAP OF REGIONAL SYSTEMS AND LIST OF INDIVIDUAL ASSETS ASSESSED WITHIN THIS FOCUS AREA LISTED BELOW:



TRANSPORTATION

- I-80 San Francisco-Oakland Bay Bridge touchdown
- 1-880
- I-580
- Port of Oakland
- Union Pacific Railroad



VULNERABLE COMMUNITIES

• West Oakland community



PRIORITY DEVELOPMENT AREAS (PDAs)

 Mixed-Use Core (Emeryville) PDA



PRIORITY CONSERVATION AREAS (PCAs)

- San Francisco Bay Trail PCA
- San Francisco Bay Water Trail (1) PCA
- Regional Trail System Gap PCA
- Oakland Potential Gateway Area PCA
- Oakland Priority Creeks PCA

Shoreline today and into the future

SHORELINE TYPE STORY

What is the shoreline made up of now?

The shoreline in this area is made up of a variety of different shoreline types, including shoreline protection structures along I-580/I-80 and around the Emeryville Marina and Park, berms, natural shorelines, and a small engineered levee surrounding the

KDIA-AM Oakland telecommunications towers.³⁴

There are also many transportation structures in close proximity to the shoreline in this Focus Area, particularly at the I-80 San Francisco-Oakland Bay Bridge touchdown area, including the toll plaza and its facilities.

SHORELINE DEVELOPMENT STORY

How will the shoreline change in the future?

This area is actively undergoing significant development activities. There are also numbers activities that have recently been permitted

by BCDC, or have ongoing permit applications in progress. These major potential shoreline changes include:

- **Emeryville Cove** recently permitted dock overhaul project including changes that impact wave attenuation (permitted by BCDC in 2019)
- I-80 San Francisco-Oakland Bay Bridge Touchdown and Potential Oakland Gateway Park currently have ongoing planning efforts for a park to come online in stages that will impact both sides of the freeway (Ongoing at time of publication)
- Powell Street/Emeryville Interchange Bay Trail Connections (Ongoing at time of publication)



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FOCUS AREA B: EMERYVILLE & WEST OAKLAND

Current and future flooding risk

OVERTOPPING STORY

Where is water coming over the shoreline?

Water begins entering at 12" TWL from overtopping of wetlands in front of I-80, as well as overtopping of berms, shoreline protection structures, and the engineered levee section near the San Francisco – Oakland Bay Bridge (I-80) touchdown and at a service road.

At 24" TWL, there is overtopping of the I-80 westbound HOV lanes, as well as additional service roads and berms near the San Francisco – Oakland Bay Bridge (I-80) touchdown (Figure 19g). At 36" TWL, additional segments of the I-80 touchdown area are overtopped, as well as embankments on Temescal Creek east of I-580/I-80 and Shellmound Street, and on natural shorelines in Emeryville Marina. At 48" TWL, overtopping of additional sections of I-80 occur and the majority of the Emeryville Marina.

At 52" TWL, overtopping of a shoreline protection structure just south of the San Francisco – Oakland Bay Bridge (I-80) touchdown leads to flooding in the West Oakland community and overtopping of an embankment under the MacAurther Maze interstate junction leads to a flooding inland in Emeryville. Overtopping increases as total water levels rise.

FLOODING EXPOSURE STORY

Where does flooding occur?

The wetlands in front of I-580/I-80 are exposed to flooding starting at 12" TWL, including the Oakland Priority Creeks and Potential Oakland Gate Area PCAs (Figure 20g). At 24" TWL flooding impacts the I-80 San Francisco – Oakland Bay Bridge touchdown in the westbound High Occupancy Vehicle (HOV) lane. By 36"

TWL, flooding expands to the toll plaza area, administrative buildings and fueling facilities, increasing through 48" TWL.

At 52" TWL, overtopping of a shoreline protection structure south of the I-80 San Francisco – Oakland Bay Bridge touchdown leads to flooding in West Oakland, while overtopping of an embankment under the MacArthur Maze interstate junction and leads to flooding of Emeryville. Flooding occurs in commercial areas in Emeryville and significant flooding of West Oakland, the Port of Oakland, and the EBMUD Main Wastewater Treatment Plant. Flooding increases in Emeryville and Oakland at 66" TWL. Another flooding threshold occurs at 77" TWL when significant new portions of Emeryville become exposed to flooding in commercial and residential areas. Flooding increases significantly as total water levels rise.





24" TWL

OVERTOPPING AND FLOODING

Figure 19g. Two total water levels selected that demonstrate first overtopping and/or significant flooding thresholds. Visit the Bay Shoreline Flood Explorer (explorer.adaptingtorisingtides.org) to see more TWLs.





FIRST FLOODING OF REGIONAL SYSTEMS ASSESSED

Regional Systems Impacted	12"	24"	36"	48"	52"	66"	77"	84"	96"	108"
Oakland Priority Creeks PCA	Ť									
Potential Oakland Gateway Areas PCA	Ť									
San Francisco Bay Trail PCA	Ť									
I-80 Bay Bridge Touchdown										
Union Pacific Railroad		•								
Port of Oakland		•								
West Oakland Communities		•			titi					
Mixed Use Core (Emeryville) PDA		•								
EBMUD Wastewater Treatment Plant		•			,					
Regional Trail Systems Gap PCA		•			š.					
I-880 (impacts access roads)		•								
I-580		• •								

Figure 20g. First exposure of regional systems. Individual assets within the four regional systems in this area are shown and colored bars represent when each asset is first exposed to flooding impacts.

Shared vulnerabilities to flooding

SHARED VULNERABILITY STORIES

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Vulnerability assessments were conducted on individual assets and then shared vulnerabilities were identified for regional systems within each focus area. The vulnerability statements below reflect shared stories of vulnerability. Our goal is to emphasize the interconnections among and across local systems, and encourage shared multi-benefits adaptation solutions.

1. Regional Connector At San Francisco – Oakland Bay Bridge Touchdown And Critical Transportation Junction

The I-80 San Francisco – Oakland Bay Bridge serves to connect commuters, passengers and goods across the San Francisco Bay. Multiple lanes are exposed to sea level rise, impacting thousands of commuters and vehicles carrying goods, as there are limited redundant bridge crossings in the region that can accommodate the redirected traffic. The I-80 San Francisco-Oakland Bay Bridge Touchdown area includes the toll plaza, administrative buildings, and fueling facilities, which contain salt-water sensitive components and could mobilize toxins in the event of flooding. This area connects the I-80 to numerous other freeways and the Amtrak Station in Emeryville, providing access to the East Bay and greater region. Disruption of any of these critical transportation services are likely to impact the regional economy by disrupting people's ability to access jobs centers, homes, the movement of goods and services across the region. Additionally, wetlands in the Potential Oakland Gateway PCA and Oakland Priority Creeks PCA are in front of the Bay Bridge touchdown area are impacted by flooding at early total water levels.

I-80 Bay Bridge Touchdown during King Tide. Photo by tektitecbd is licensed under CC BY 2.0.



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2. Important Job Center, Future Housing And Regional Transportation Corridor Across The East Bay

The City of Emeryville is a major job center in the East Bay and contains the Mixed-Use Core PDA, which is projected to increase households significantly by 2040. It also contains the Emeryville Amtrak Station, which serves as a passenger rail stop on the interregional connection across the East Bay and to the Central Valley. This function is vulnerable to sea level rise impacts because the station building and supporting utilities and infrastructure have below grade components, and because vulnerable parts of the rail line elsewhere may be damaged or disrupted. This area is also vulnerable to sea level rise impacts due to exposure of current commercial development and sites of future housing. The Bay Trail is also vulnerable to sea level rise and flooding impacts disrupt the ability of it to be used as a commuter route to job centers in the area. This area is protected by the Emeryville Crescent wetland habitat, which serves as the first line of bayshore defense. These vulnerabilities are exacerbated by multiple owners and managers of shoreline property, including the Port of Oakland, and the ongoing transfer of property to other entitles, such as the owners and managers of the Potential Oakland Gateway PCA.

3. West Oakland Community Coordination Across Complex Ownership And Multiple Assets

The West Oakland Community supports housing and community services for vulnerable populations in the area and is exposed to flooding. Many of the homes in the West Oakland Community consist of older and aging homes that are more vulnerable to flooding impacts. Lack of information about the condition of the railroad and the social vulnerability characteristics of the West Oakland community mean flooding impacts in this area will likely have disproportionate impacts on the community. These vulnerabilities are exacerbated by multiple owners and managers of shoreline property, including the Port of Oakland, and the ongoing transfer of property to other entitles, such as the owners and managers of the Potential Oakland Gateway PCA.









Shared vulnerabilities to flooding



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4. Port Of Oakland Supports Specialized Container Cargo

The Port of Oakland is among the busiest ports in the United States and handles the majority of container cargo movement in Northern California. It is connected to other ports and regions through the Union Pacific Rail line as well as nearby freeways. The Port has facilities directly exposed to sea level rise, potentially impacting the function, and has indirect vulnerabilities due to exposure of the UPRR tracks, which impacts the ability to move goods to and from the Port. A complex arrangement of ownership and operations presents a challenge to sufficiently understanding vulnerabilities of the Port and Union Pacific Rail. There is a lack of redundancy of Seaports in the San Francisco Bay Area, and limited opportunity regionally to accommodate the Port's specialized cargo services.

5. Critical Infrastructure Including Regional Wastewater Treatment Plant And Waste Processing

This Focus Area contains critical infrastructure including the East Bay Municipal Utilities District (EBMUD) Main Wastewater Treatment Plant (which provides critical wastewater service to over half a million residents, communities, and businesses in the surrounding cities) and two waste transfer/processing facilities, are exposed to flooding. There is a lack of redundancy of wastewater treatments plants in the area and limited capacity for other treatments plants to accommodate the wastewater treatment needs in the event of disruptions from flooding. Additionally, mobilization of untreated wastewater or contaminants from the waste processing facilities could cause public health concerns in the event of flood, especially for the nearby West Oakland community. The presence of untreated wastewater also has additional public health implications as untreated wastewater is the preferred habitats for mosquitoes capable of transmitting West Nile Virus, which could carry diseases into nearby communities.



Shared consequences to flooding

SHARED CONSEQUENCE STORIES

This section translates shared vulnerability statements into stories of shared consequences. The ART program considers consequences through frames of sustainability: Society and Equity, the Economy and the Environment.



Society and Equity • The Bay Trail, a publicly accessible commuter and recreation route, has segments exposed to flooding as early as 12" TWL. Because the Bay Trail functions as an interconnected system, disruptions at any segments can limit and disrupt its use for commuters and visitors who may use the route to access employment in Emeryville and from other areas including the cities of Oakland, Berkeley and others. The Bay Trail also serves to connect users to other recreation areas such as the Oakland Priority Creeks and Potential Oakland Gateway Area PCA.

This Focus Area includes a large community considered to have among the highest social vulnerability in the region, as well as among highest contamination burdens. Flooding in the West Oakland community is likely to have a disproportionately larger impact on these communities as they possess characteristics that may make it more difficult to prepare for, respond to, or recover from flood events. Additionally, they rely on multiple different public and private agencies for flood protection. The presence of the EBMUD Wastewater Treatment Facility and two waste transfer/processing pose potential hazards to people in this area.



Economy • The Port of Oakland provides critical services to the regional economy as it handles the largest volume of container shipments of any port in the San Francisco Bay. Disruptions to port access roads, railroad tracks and railroad yard are likely to have significant economic consequences both locally and regionally as goods cannot be moved. Flooding at the San Francisco – Oakland Bay Bridge (I-80) touchdown with impacts to the toll plaza and building facilities will also have significant consequences as it carries numerous public bus transit routes and serves a regional commuter and goods movement role.

Additionally, flooding impacts to the Mixed-use Core PDA in Emeryville is likely to have large economic consequences as it is a significant job center in the east Bay and flooding of the area, including the Amtrak/Capital Corridor Station will disrupt the ability of commuters to access employment centers and housing. Additionally, the Port plays a role in emergency response and this critical function will be disrupted in the event of flooding.

Environment • The wetlands in the Oakland Priority Creeks Potential Oakland Gateway Area PCAs and wetlands in the City of Emeryville are exposed to flooding early and constrained by major transportation routes including the San Francisco – Oakland Bay Bridge (I-80) touchdown and I-580/I-80, meaning they are unable to migrate to avoid drowning. These wetlands are important for preserving habitat connecting to the few remaining wetland areas in this region. There are currently two active wetlands habitats: the first being Radio Beach, a beach and dune nourishments site with removal of non-native species and the second being the Oakland Gateway Shoreline Public Access site, which is working to restore the eroding shoreline, improve water quality and public access to link the gateway park to the Bay Trail. This area is also important as it is one of the few places where beach and remnant dunes in the east bay remain. However, this area is also a former Oakland Navy Base with remedial action zones from past hazardous spills.



Advancing adaptation solutions

FITTING INTO REGIONAL **STORY**

How are local areas contributing to **Regional Hot Spots?**

The regional scale analysis of ART Bay Area identified clusters of highest consequences around the region, called "Regional Hot Spots." These

areas include places that contain the top five highest consequences in the region for 1) any transportation asset and 2) either a PDA or PCA, and 3) the presence of a vulnerable community block group.

Dataset were identified for each regional system to provide a measure of consequence to quantify impacts in the event of flooding. A full list of consequences used for each regional system can be found in Chapter 2.1 Regional Hot Spots.

This Focus Area is part of a Regional Hot Spot, meaning it contains a cluster of assets that have among the highest consequences of flooding in the region. For this cluster,

Regional Hot Spot PDA Transportation Infrastructure PCA Vulnerable Community

Regional Hot Spot at 24" TWL

some assets fall outside this specific focus area but can be found in the nearby focus area in the San Leandro OLU Local Assessment.

The Downtown Oakland/West Oakland area becomes a Regional Hot Spot starting at 24" TWL, and remains a Regional Hot Spot at every total water level through 108" TWL. It is an early Hot Spot and remains critical to the region over time (Figure 21g).

The assets driving the Oakland cluster at 24" TWL includes the Downtown and Jack London Square PDA (outside this specific focus area), Port of Oakland, Jack London Ferry Terminal (outside this specific focus area), and numerous block groups with significant social vulnerability and contamination.

Chapter 4 Regional Adaptation provides adaptation responses for regional issues.

Figure 21g. Downtown Oakland Hot Spot: From 24" TWL to 108" TWL, this Focus Area contains clusters of assets that have among the highest consequences of flooding in the region.



Area of Impact C: Cerrito Creek and Albany Beach



Location

This Area of Impact lies directly on the border of Contra Costa and Alameda counties including Cerrito Creek, the I-80 and I-550 interstate junction, and Albany Bulb. It is bordered by Central Avenue (north), the OLU boundary (east), Golden Gate Fields (south) and San Francisco Bay (west). It is approximately 1.9 square miles. (Figure 22g).



Figure 22g. Top: Identification of where area of impact is within OLU. Bottom: Map of area of impact containing regional systems. Individual assets assessed in this area of impact are labeled on the map and listed on the following page.



Albany Beach. Map data ©2019 by Google.

Why shared stories of vulnerability?

This Area of Impact was selected because it contains a variety of regional systems, including transportation routes of I-80/I-580 junction, and two PCAs.

Due to overlap and dependencies among these regional systems in this area, the vulnerabilities of these systems to flooding and sea level rise are discussed together in shared stories of the shoreline type, overtopping, and exposure to flooding. By communicating shared vulnerabilities and consequences, our goal is to encourage shared multi-benefit solutions to protect people, economies, and environments into the future.

Figure 22g. MAP OF REGIONAL SYSTEMS AND LIST OF INDIVIDUAL ASSETS ASSESSED WITHIN THIS AREA OF IMPACT ARE LISTED BELOW:



TRANSPORTATION

- I-580
- I-80
- Union Pacific Railroad (UPRR)



PRIORITY CONSERVATION AREAS (PCAs)

- San Francisco Bay Trail PCA
- San Francisco Bay Water Trail (1) PCA
- Cerrito Creek PCA

Shoreline today and into the future

future?

SHORELINE **TYPE STORY**

What is the shoreline made up of now?

There are a variety of shoreline types in this Area of Impact, including wetlands to the west of the I-580 and an open channel at the mouth of Cerrito Creek. Shoreline protection structures exist along the shoreline at the Albany Bulb.³⁵

SHORELINE DEVELOPMENT **STORY**

OVERTOPPING STORY

How will the shoreline change in the

In this location an Albany Beach restoration and public access project as well as beach restoration and Bay Trail extension and connection to existing trails were ongoing at time of publication.

Where is water coming over the shoreline?

Overtopping occurs at 12" TWL over wetlands just north of the Cerrito creek mouth on Contra Costa County side, and within the creek embankment (Figure 23g). At 24" TWL, overtopping occurs over shoreline protection structures near the Albany Beach Water Trail site. At 36" TWL, additional overtopping occurs over embankments at Buchanan Street. Overtopping of the I-580 (John Knox Freeway) also occurs. At 77" TWL, significant portions of the Cerrito Creek embankments are overtopped, leading to significant flooding.

FLOODING EXPOSURE **STORY**

Where does flooding occur?

Flooding impacts wetlands west of the I-580 (John Knox Freeway) at 12" TWL, as well as Albany Beach (Figure 24g). At 36" TWL, flooding impacts Buchanan Street and the Golden Gate Fields area, increasing across the parking lots down to Fleming Point as water levels rise to 66" TWL. At 77" TWL, a flooding threshold occurs at Cerrito Creek and residential households north of Albany Hill Park become flooded. Flooding impacts increase as total water levels rise.



12" TWL

OVERTOPPING AND FLOODING

Contra Costa

Alameda

Figure 23g. Two total water levels selected that demonstrate first overtopping and/or significant flooding thresholds. Visit the Bay Shoreline Flood Explorer (explorer.adaptingtorisingtides.org) to see more TWLs.



36" TWL

FIRST FLOODING OF REGIONAL SYSTEMS ASSESSED

Regional Systems Impacted	12"	24"	36"	48"	52"	66"	77"	84"	96"	108"
Albany Beach PCA	Ť									
San Francisco Bay Trail PCA	Ť									
Cerrito Creek PCA) J							
Union Pacific Railroad										
I-580*										
I-880*			•	• •	• •	•				

Figure 24g. First exposure of regional systems. Individual assets within the four regional systems in this area are shown and colored bars represent when each asset is first exposed to flooding impacts. * refers to impacts to access and on-ramps that may disrupt service to transportation assets listed.

tornices Creek

Shared vulnerabilities to flooding

SHARED VULNERABILITY STORIES

Vulnerability assessments were conducted on individual assets and then shared vulnerabilities were identified for regional systems within each focus area. The vulnerability statements below reflect shared stories of vulnerability. Our goal is to emphasize the interconnections among and across local systems, and encourage shared multi-benefits adaptation solutions.

1. Recreation Impacts Occur Early and Are Connected

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The Albany Beach Water Trail PCA site provides recreational access to the public and is connected to other areas via the San Francisco Bay Trail PCA. This recreational site is vulnerable to sea level rise impacts because the single access road to reach this site on Buchanan Street is exposed to sea level rise. This area is vulnerable due to both its limited access as well as the sandy beach characteristics of the water trail launch site, which is more vulnerable to sea level rise than other sites, such as elevated docks. Additionally, impacts will reduce connections of the Bay Trail for commuters and residents.



2. Dependency on others for shoreline and flood protection

The Cerrito Creek PCA provides recreational access to the public and is connected to other areas via the San Francisco Bay Trail PCA. Flooding occurs from overtopping of the Cerrito creek embankments, leading to inland flooding of residential households. Due to a lack of information, it is unknown how sea level rise, riverine flooding, and/or groundwater rise may lead to flooding impacts to nearby communities earlier. These households depend on the Cerrito Creek PCA for flood control protection, but the PCA's vulnerabilities are exacerbated by a complex ownership and management structure.

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Shared consequences to flooding

SHARED CONSEQUENCE STORIES

This section translates shared vulnerability statements into stories of shared consequences. The ART program considers consequences through frames of sustainability: Society and Equity, the Economy and the Environment.



Society and Equity • The Bay Trail in this area is used by residents and visitors to access recreational sites including Point Isabel Shoreline park and Albany Bulb, among others. Both the Bay Trail and Water Trail sites allow people to enjoy the natural beauty of the San Francisco Bay and disruption of these sites will limit the opportunities for people to access the Bay.



Economy • Disruptions to UPRR rail could have significant consequences to the regional economy as it is a critical link between the Ports of Richmond and Oakland and provides for the movement of goods and passengers across the Easy Bay. Both the Port of Richmond and Oakland provide specialized services that support local and regional economies in the Bay Area.



Environment • Flooding impacts to Albany Beach at 12" TWL reduce the few area in the San Francisco Bay where sand beaches and dunes still remain. This area also surrounds the Albany Mudflats State Marine Park and has a small area of wetlands that support wildlife habitat. Loss of wetlands habitats and transition of mudflats into subtidal habitats due to flooding will change the composition of species utilizing this area.

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