4.3.17 Transportation Failure

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the transportation hazards in Essex County.

2020 HMP Update Changes

- All subsections have been updated using best available data.
- Previous events between 2014 and 2019 were researched, with a comprehensive list of previous events in Appendix X.

4.3.17.1 Profile

Hazard Description

Essex County is vulnerable to vehicular accidents, aviation accidents, railway accidents, bridge failures, and roadway failures and flood vulnerable roadways.

Essex County is located adjacent to New York City and along the major transportation routes connecting the New York and Philadelphia metropolitan areas. Port Newark is also located in the County. Traffic flow through the County is critical to economic prosperity in the entire region (Essex County HMP 2007). The County possesses an extensive transportation network, including many rail and fixed route bus services, as well as demand responsive, ridesharing, and shuttle services (Essex County Transportation Plan 2013).

The majority of fixed route service in Essex County is provided by New Jersey Transit (NJ Transit) or private carriers. There are 60 bus routes and 5 light rail routes and commuter rail lines. Private carriers mostly serve trips to New York City, although there are at least three privately operate local bus routes. NJ Transit operates commuter rail, light rail, and bus service in Essex County. Commuter rail service is provided on the Morris and Essex Rail Line and on the Boonton Line. Morris and Essex service operates to Hoboken Terminal and New York Penn Station with stops in Essex County at Newark Broad Street and eight other stations on the Morristown Line. Rail service is also provided to Hoboken on the Boonton Line from six stations in northern Essex County (Essex County Transportation Plan 2008, 2013).

NJ Transit provides 53 bus routes and one light rail route in the County; 39 of which serve the City of Newark. Nine others provide service to New York City. The remainder primarily provide local service (NJ Transit System Map 2014).

Transportation systems available in Essex County include large, interconnected rail, roadway, and water transportation networks. Major highways accessible to Essex County includes the Garden State Parkway; New Jersey Turnpike; Interstates 78, 80, and 280; Routes 1-9, 21, 22, 23, 24, and 46; and the Eisenhower Parkway. Public roads have a total mileage of 1,673 miles; total interstate mileage is 27 miles; state highway mileage is 59 miles; county road mileage is 233 miles; and municipal road mileage of 1,330 miles. The County also has three of the nation's major transportation centers, which includes Newark Liberty International Airport, Port Newark, and Penn Station (Essex County 2014). Roadways exposed to the 1-percent annual chance of flooding hazard area include: NJ-7, NJ-10, NJ-21, NJ-23, NJ-24, NJ-27, NJ-124, NJ-159, I-78, I-80 I-95, I-280, US-1, US-22, and US-46 and the Garden State Parkway. All these systems and supporting resources provide services locally, regionally, nationally, and internationally.

Vehicular Accidents

A vehicular accident is a road traffic incident that usually involves one road vehicle colliding with another vehicle or other road user, such as an animal or a stationary roadside object. A vehicular accident may result in injury, property damage or possibly fatalities. Many factors contribute to vehicular accidents, including: equipment failure, poor road conditions, weather, traffic volume, and driver behavior.

Aviation Accidents

According to the International Civil Aviation Organization, an aviation accident is an occurrence with the operation of an aircraft which takes place between the time a person boards the aircraft with the intention of flight to the time the person has disembarked the aircraft. There are three different occurrences that determine an aviation accident: a person is fatally or seriously injured; the aircraft sustains damage or structural failure; or the aircraft is missing or completely inaccessible. An aviation incident is an occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation (International Civil Aviation Organization, 2015).

Railway Failures and Accidents

Freight, commuter, and subway lines are all located in Essex County. These lines may fail due to weakening joints, erosion, and unstable rails that can cause train-car collisions and derailment. Subway breakdowns may occur as a result of aging machinery.

Rail transportation's underground and aboveground rails are vulnerable to weather-related events as well. Flooding from coastal storms and heavy precipitation events can impact underground rails, while strong winds can impact aboveground rails by derailing rail cars. Extreme temperatures can affect railroad tracks by causing the steel to shrink during extreme cold and buckle during extreme heat events (NYC HMP 2014).

An at-grade railroad crossing is an intersection where a public highway, road, street, or private roadway crosses one or more railroad tracks at grade, or at the same ground surface level. These crossings are marked by crossbucks, stop signs, or other signals, and may be identified by a U.S. DOT inventory number (49 CFR 218.93).

Roadway and Bridge Failures

Bridges, tunnels and roads are all make up a part of the transportation network in Essex County. All of which are vulnerable to deterioration from use and climate. The following provides information regarding bridge and roadway failures.

Bridge Failures

Bridge components are subject to cracking, rusting, ground subsidence, and corrosion caused by exposure to water, vibration, ozone, dust, dirt, chemicals in salt products, and gasoline (NYC HMP 2014).Bridge failure generally results in a more severe impact as compared to non-bridge roadway failures. Failure of bridges may also adversely impact the feature it was designed to cross (another roadway, body of water, rail line, etc.). In Essex County, when considering all stream and river crossing, crossing of rail over roadways and vice versa, crossing of roadway over roadway, and pedestrian crossings , there are hundreds of bridges within the County (Essex County HMP 2007).

Roadway Failures

Roadway failures occur frequently and include long-term structural fatigue, overweight traffic, accidents, fuel or hazardous material discharges, or acts of terrorism. During roadway closures, traffic is disrupted and depends on the type of roadway failure (Essex County HMP 2007). Roadways are typically less likely to fail than bridges;

however, subsurface conditions such as sinkholes or collapsed sewers can undermine streets. For example, retaining walls are critical to the structural integrity of roadways and a failure of the wall can close roads and/or cause major traffic disruptions (NYC HMP 2014).

Flood Vulnerable Roadways

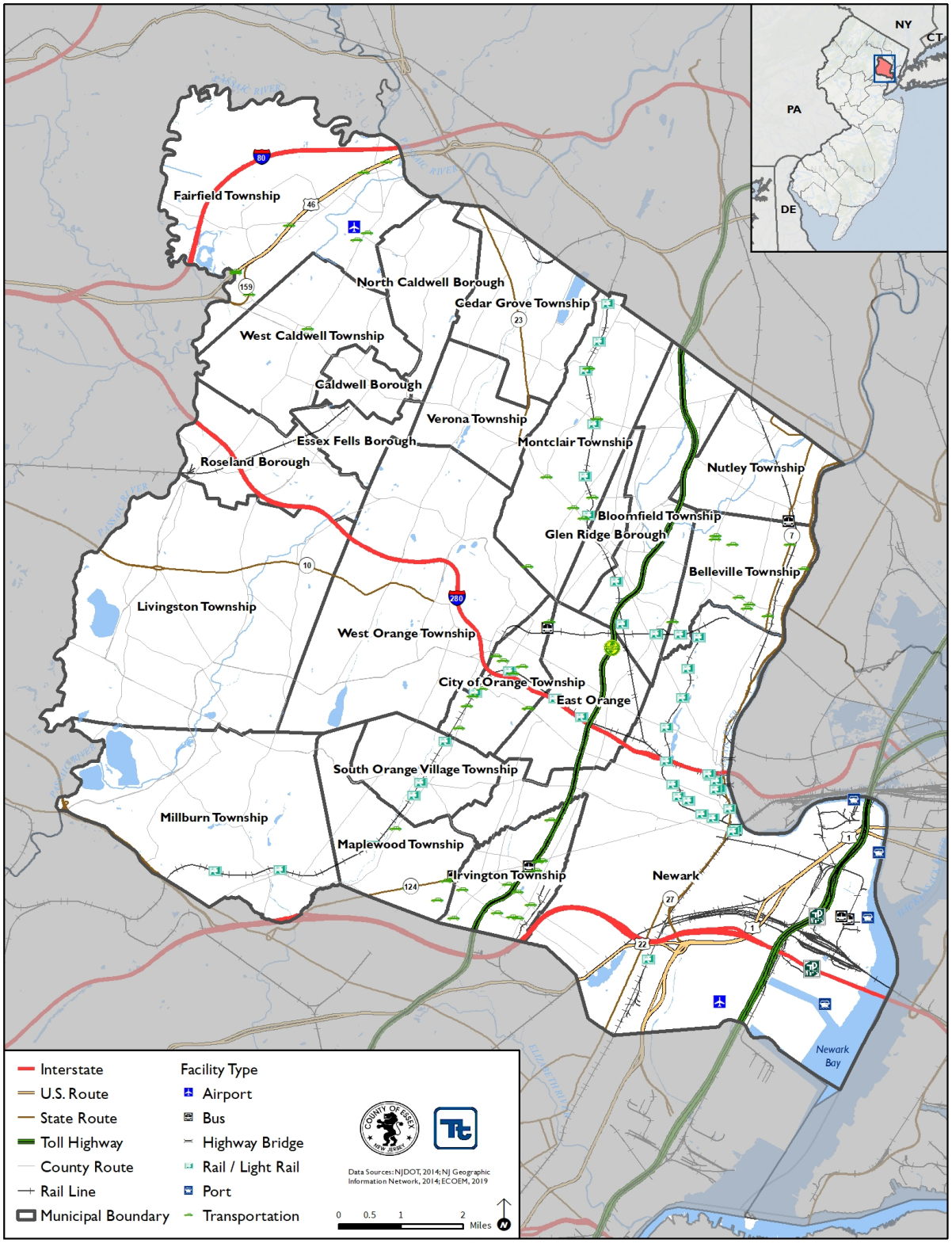
A flood vulnerable roadway is any public road that has a history of being covered by enough water in a manner that the road surface, markings and edges are not visible to the operator of a vehicle, cyclist or a pedestrian. These conditions can be caused by stream/river flooding, poor drainage along roadways or normal surface runoff. Water on the roadway can be either standing or moving and could also leave debris such as gravel, leaves and sticks on the roadway. Duration of the flooding event can vary from minutes to days (Fifth Planning District Commission, 1999).

Location

Essex County is full of transit infrastructure, especially in the eastern parts of the County. Transit is available in the form of rail, light rail, bus, and paratransit (shuttle). NJ Transit is the primary transit provider in Essex County and operates a bus and rail hub at Newark Penn Station, as well as the Newark Light Rail (subway) that links Penn Station with Broad Street Station and Bloomfield (Essex County Comprehensive Transportation Plan 2013).

Figure 4.3.17-1 illustrates the transportation facilities and major roadways located in Essex County.

Figure 4.3.17-1. Transportation Facilities and Roadways in Essex County



Vehicular Accidents

A vehicular accident can occur on any traveled roadway in Essex County. Areas of particular concern include areas of roads that are difficult to navigate, conducive to accidents, historically accident-prone, adjacent to water bodies, and pass through populated or highly traveled areas.

The County-owned radial roads, including Bloomfield Avenue, Springfield Avenue, Clinton Avenue, and South Orange Avenue, all serve both local and regional travel, including travel to and from New York City. These roads become very congested, especially in areas of high pedestrian activity, which often results the pedestrian mobility and safety and hazardous conditions for bicycles (Essex County Comprehensive Transportation Plan [ECCTP] 2013).

The roadways in Essex County consist of various functional classes and allows for travel between residential areas and the commercial/business establishments throughout the County. Major state roadways include the Garden State Parkway; I-280; I-80; and I-78. In addition to these major roadways, numerous state and county routes are present throughout Essex County as well. In total, there is approximately 1,767 miles of roadway in the County (ECCTP 2013).

Aviation Accidents

With Newark International Airport and Port Newark located within Essex County, the County is a major national transportation hub with an extensive network of rail, highway, air and sea transportation and it is home to one of the world's largest containerized shipping ports (Essex County Division of Planning 2014).

Newark Liberty International Airport is located in the southeast part of the County and is one of the three major airports in the New York metropolitan area. It is operated by the Port Authority of New York & New Jersey (PANYNJ). Additionally, the Port Authority operates the Port Newark-Elizabeth Marine Terminal in Essex County, which is the largest port facility on the east coast and the third largest in the U.S. This port is located on the Newark Bay and serves as the principal container ship facility for goods entering and leaving the New York-New Jersey area (ECCTP 2013).

The Essex County Airport CDW (ECA), also known as Caldwell Airport, is located entirely in the Township of Fairfield and is owned and operated by Essex County Improvement Authority (ECIA). The ECIA is governed by a seven member Board of Commissioners appointed by the County Executive with the consent and approval of the Essex County Board of Chosen Freeholders. The Essex County Airport is a general aviation facility whose campus is located on approximately 278 acres of land. It is located 20 miles west of New York City and 10 miles west of Teterboro Airport. This airport is easily accessible from State Highways 23, 46, 80, 280, and 287. Public transportation to the airport is available via NJ TRANSIT bus service and from the PANYNJ in New York City (ECCTP 2013).

Railway Failures and Accidents

Essex County has approximately 26 miles of railroad track and 21 railroad stations, including Newark Penn Station, which is the hub for Amtrak service. The Port Authority Trans Hudson (PATH) system is a subsidiary of the Port Authority of New York and New Jersey. This heavy rail rapid transit system is the country's 7th largest subway system. It serves as the primary transit link between New York City and urban and suburban communities in New Jersey and handles 250,000 passengers each day (ECCTP 2013).

Amtrak is a federally-owned railroad that provides inter-city passenger service to Newark Penn Station, serving more than 680,000 passengers, and Newark International Airport, serving more than 127,000 passengers. The Northeast Corridor Line runs between Washington D.C. and Boston and services other major east coast cities such as New Haven, New York City, Trenton, Philadelphia, and Baltimore (ECCTP 2013).

There are five NJ TRANSIT commuter lines that travel through Essex County: Northeast Corridor, Raritan Valley Line, Morris and Essex Lines, Montclair-Boonton Line, and North Jersey Coast Line. There are a total of 21 NJ TRANSIT stations located in Essex County. Newark Penn Station is an important multi-modal transportation hub that serves the Northeast Corridor, the Raritan Valley line, PATH, as well as numerous NJ TRANSIT bus routes. These stations have eight tracks, with seven of them on one level and the other track for PATH service on an upper level (ECCTP 2013).

The Conrail Lehigh Line is a main east/west route serving the region and one of the busiest rail lines in the U.S. In the City of Newark, the railroad enters Oak Island yard, the largest classification yard in New Jersey, and then continues across Newark Bay to Jersey City. West of the Oak Island yard, the Lehigh connecting track links the Lehigh Line with the Passaic & Harsimus Line which runs to the intermodal terminals in Kearney and North Bergen (ECCTP 2013).

The Chemical Coast Secondary is a major north/south rail line and serves Port Newark/Elizabeth and the intermodal terminal serving the Port Newark Container Terminal (PNCT) at Portside Yard. A new flyover connection between PNCT and Portside allows direct transfer from ship to rail without having to access city streets. Running north from Oak Island are the Brills Lead and the Bay Shore Lead which serve the intermodal transfer activities in Brills Yard and various industries along Doremus Avenue (ECCTP 2013).

The responsibilities for public crossings at grade are shared between the railroad and the road/highway agency. The railroad is responsible for the crossing surface between the out ends of the railroad ties, for the installation of the crossbuck signs where no signals are present, and for the operation and maintenance of the railroad crossing signals and associated control circuitry. The road or highway agency is responsible for warning and regulatory signs on the approaches to the crossing, for pavement markings and for the street or highway approaches outside the end of the railroad ties (West Virginia Department of Transportation, Date Unknown).

Roadway and Bridge Failures

Bridge Failures

Essex County's transportation network includes operation and maintenance of four swing bridges over the Passaic River, provides maintenance of 131 stationary bridges and 230 culverts. The bridges and culverts represent critical nodes that allow traffic to efficiently navigate the County's diverse topography (ECCTP 2013).

Roadway Failures

See the vehicular accident section for a summary of roadways in Essex County.

Flood Vulnerable Roadways

According to FEMA, flood hazard areas are defined as areas that are shown to be inundated by a flood of a given magnitude on a map. These areas are determined using statistical analyses of records of river flow, storm tides, and rainfall; information obtained through consultation with the community; floodplain topographic surveys; and hydrologic and hydraulic analyses. Flood hazard areas are delineated on FEMA's Flood Insurance Rate Maps (FIRM), which are official maps of a community on which the Federal Insurance and Mitigation Administration has indicated both the Special Flood Hazard Areas (SFHA) and the risk premium zones applicable to the community.

In addition to FIRM, FEMA also provides FISs for entire counties and individual jurisdictions. These studies are narrative reports of countywide flood hazards, including descriptions of the flood areas studied and the engineered methods used, principal flood problems, flood protection measures and graphic profiles of the flood sources. A countywide FIS for Essex County has been completed and discusses the principal flood problems in

Essex County including flood vulnerable roadways (FEMA FIS, 2017). Major roadways exposed to the FEMA delineated Special Flood Hazard Area include: The Garden State Parkway, I-280, I-78, I-80, I-95 (NJ Turnpike), NJ-7, NJ-10, NJ-21, NJ-23, NJ-24, NJ-124, NJ-159, US-1, US-22, and US-46. See the Flood Hazard section (5.4.6) for more information and individual municipal annexes (Section 9) for information on localized problem areas.

Extent

Vehicular Accidents

There is no warning time for vehicular accidents. Contributing factors for these accidents are typically associated with the driver, vehicle and the environment. Factors associated with the driver include: error, speeding, experience, and blood-alcohol level. Factors associated with the vehicle include: type, condition, and center of gravity. Environmental factors include: quality of the infrastructure, weather, and obstacles. The majority of vehicular accidents are attributed to the driver. Vehicular accidents can have severe effects on those directly involved, as well as effects to others not directly involved. Other effects may include: severe traffic delays, lost sales to businesses, delayed commodity shipments, and increased insurance costs (Cova and Conger, 2004).

Aviation Accidents

Approximately 80-percent of all aviation accidents occur shortly before or during take-off and landing. These are usually said to have been caused by human error. Mid-flight accidents are rare but not unheard of. A survey was conducted on 1,843 plane crashes that occurred between 1950 and 2006. The survey showed that of those 1,843 plane crashes, 53-percent were due to pilot (human) error; 21-percent due to mechanical failure; 11-percent due to weather; eight-percent due to other human error (lack of communication, improper maintenance); 6-percent due to sabotage and terrorism; and 1-percent due to other causes (Krasner, 2009).

Aviation accidents are often devastating incidents that may result in serious injuries or fatalities. The Federal Aviation Administration (FAA) and the National Transportation Safety Board (NTSB) are the agencies responsible for monitoring air travel and investigation accidents. Some of the most common causes of aviation accidents occur as a result of the violation of FAA and NTSB regulations. Some other causes of accidents include, but are not limited to:

- Pilot or flight crew errors – Pilot errors are the number one cause of aviation accidents and account for the highest number of fatalities. Pilots have the responsibility to transport passengers safely from one place to another and follow the FAA and NTSB regulations to better ensure passenger safety. If a pilot or flight crew makes an error, an accident may occur.
- Faulty equipment – Faulty aircraft equipment and/or mechanical features are another common cause of an aviation accident.
- Aircraft design flaws – The manufacturer of an aircraft is responsible for an aviation accident if the structural design is flawed and results in an accident.
- Failure to properly fuel or maintain the aircraft – If any regulations and safety standards set by the FAA or NTSB are violated, an accident may occur.
- Negligence of Federal Air Traffic Controllers – The failure of air traffic controllers to properly monitor the airways is another cause of aviation accident (Aviation Law News, Date Unknown).

Railway Failures and Accidents

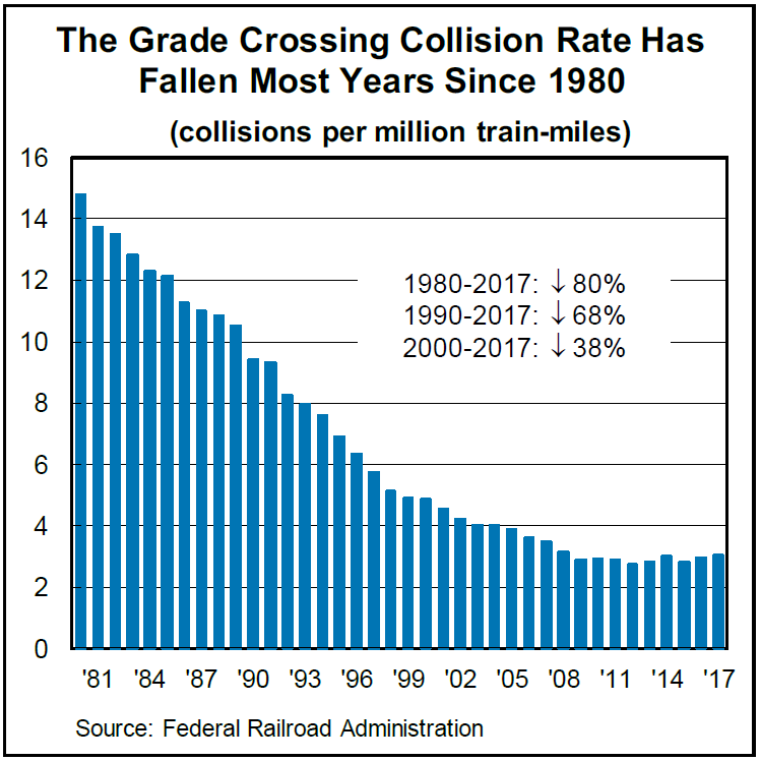
Accidents involving trains and pedestrians, or motor vehicles are severe. For most local road officials, at-grade railroad crossings are the most common exposure to railroads. Such crossings are often a nuisance for both

highway and railroad officials. Railroad crossings are a conflict point between two different transportation systems, which have different operating characteristics and different needs (Association of American Railroads, 2012).

As of 2018, there are more than 200,000 at-grade crossings in the U.S (Association of American Railroads 2018). In 2017, there were 10,589 incidents at public highway-rail crossings in the U.S. that resulted in 822 deaths and 8,810 injuries (U.S. Department of Transportation 2018).

Between 1980 and 2017, the number of grade-crossing collisions fell 80% (Figure 4.3.17-2). Injuries associated with collision fell 79% and fatalities fell 67% (Association of American Railroads 2018). According to the Federal Railroad Administration, as of 2019, there are 466 highway-rail crossings in Essex County (Federal Railroad Administration 2019).

Figure 4.3.17-2. Highway/At-Grade Railroad Crossing Collision Rate, 1980 through 2017



Source: Association of American Railroads 2018

Roadway and Bridge Failures

The severity of roadway and bridge failures in Essex County depends on the size and criticality of affected networks, their location, the number of people directly impact, and the secondary impacts to essential services and the economy. A failure's severity can range from localized occurrence to a system-wide incident (New York City HMP 2014).

Flood Vulnerable Roadways

There are heavily trafficked roadways (parkways and secondary roads) used by automobiles and trucks through the County; some of which experience frequent flooding. These roads are used by residents, commuters and for transporting all types of materials, including hazardous materials. Hazardous materials in transit include substances or materials determined to be capable of posing an unreasonable risk to health, safety or property

when transported. These routes traverse residential neighborhoods, making the nearby residential population and environment vulnerable. A major accident in each of these transportation systems is possible and could impact the County (minimal to severe). Areas of urban flooding which affect roadways were identified by local municipalities during the planning process including:

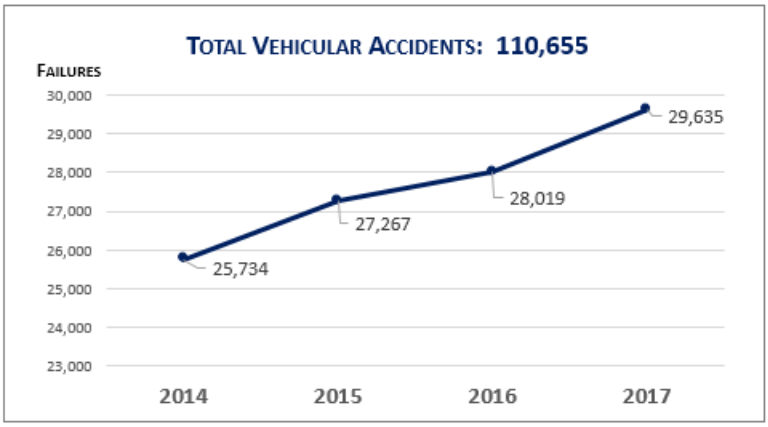
- Bloomfield Avenue in Caldwell Borough
- Bloomfield Avenue and Verona Park in the Township of Verona
- Lindsley Avenue near North Caldwell's Border in the Township of Cedar Grove
- Forest Way in Essex Fells Borough
- Devon Road in Essex Fells Borough
- Horseneck Road in Fairfield Township
- Came Plane Road in Fairfield Township
- Dwight Place in Fairfield Township
- Washington Avenue and Lincoln Drive in Fairfield Township
- Passaic Avenue in Fairfield Township
- Drake's Lane in Irvington Township
- Lennox Avenue in Irvington Township
- Navlon Avenue in Livingston Township
- Naylon Place in Livingston Township

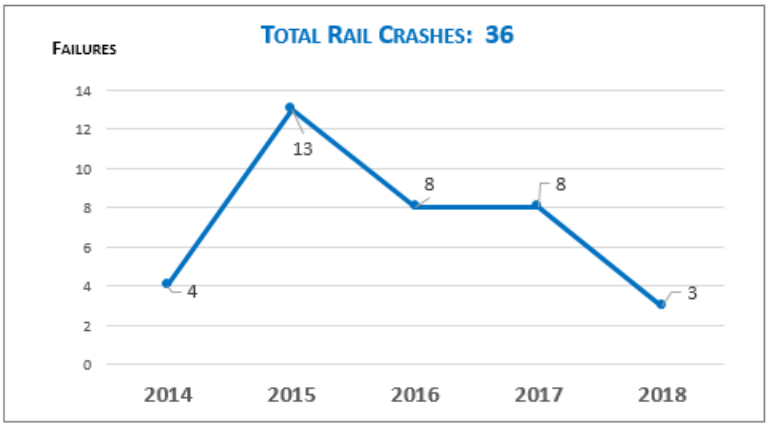
See Section 4.3.6 (Flood) for detailed information on the extent for flood and flood vulnerable roadways. Individual municipal annexes (Section 9) contain additional information on localized problem areas.

Previous Occurrences and Losses

Many sources provided historical information regarding previous occurrences and losses associated with transportation failure events throughout the State and Essex County. With so many sources reviewed for the purpose of this HMP, loss and impact information for many events could vary depending on the source. Therefore, the accuracy of monetary figures discussed is based only on the available information identified during research for this HMP. Figure 4.3.17-3 below displays the number of vehicular and rail accidents since 2014 with the best available data accessible. This data shows an increasing number of vehicular accidents occurring annually, but a decrease in the number of rail accidents occurring annually over the last 5 years. Additional information regarding these accidents is available in Table 4.3.17-1.

Figure 4.3.17-3. Transportation Accidents in Essex County





Source: Federal Railroad Administration 2019, NTSB 2019; NJDOT 2018

Table 4.3.17-1 includes railway, automobile, and aviation accidents from 2014 to 2019. The State of New Jersey was not included in any FEMA disaster (DR) or emergency (EM) declarations in regard to transportation failure events.

Table 4.3.17-1. Transportation Failure Incidents in Essex County, 2014 to 2019

Date	Type	Description
2014	Vehicular Accidents	In 2014, as reported by NJDOT, there were 25,734 vehicular accidents in Essex County.
May 15, 2014	Rail Crash	While humping two loaded tank cars into track 46 class, cars rolled out east end and sideswiped a cut of cars out to foul on track 48 class – no derailment.
June 19, 2014	Rail Crash	FO33 was stretched out of track 44 waiting for signal when car TILX 100528 was not stopped by inert retarder on track 50 class and stuck their train. ($300.00 track damage to TRACAK #50).
July 1, 2014	Rail Crash	Loaded tank car OLNX 718092 was bumped out of track 48 by a two car cut of loaded tank cars GATX 33616 AND UTLX 645931, striking train F033 on track #50 causing 11 cars to derail. track damage to track #48 is $480. track damage to track #50 is $370.
August 19, 2014	Rail Crash	Train #1009 derailed wheels 1-3 of lead engine #4008, wheels 1-3-4 of #6556, all wheels of #6542 and1 wheel of #6546 due to a defective concrete tie at MP 11.7 in Montclair.
January 13, 2015	Rail Crash	Crew was humping and car ADMX 28199 sideswiped car ADMX 25120, causing both cars to derail.
January 23, 2015	Rail Crash	While humping track R3, MLMX 256 exited retarder AT 11.85 mph ran out and sideswiped UTLX 674563 on track #2 derailing MLMX 256. track #36 sustained $150.00 in track damages. track #32 sustained $1,860.00 in track damages.
February 11, 2015	Rail Crash	TOAX 880187 on 2 compound track sideswiped the TTGX 986257 on 3 compound track that was left in the foul. 9,550 in equipment damages and $2,800 in track damages.
February 28, 2015	Rail Crash	FO64 was humping cars; the NS 406909 was headed down 18:.02 retarder when the west end of car diverted to 18:03. the next car BGEX 443071 on retarder 18:02 struck the NS 406909. retarder 18:03 sustained $25, 537. 00 in damages. retarder 18:02 was not damaged.
March 14, 2015	Rail Crash	At 12:40 pm on Saturday, March 14, 2015 an eight-car PA-5 train consist was standing on track G in south street yard. Amtrak reported smoke issuing from the train. the power director removed power from tracks G9-10 AND H9-10. transportation division operations examiner M. Biancamano responded to the scene and escorted the Newark fire department to the location of the fire. the Newark car equipment division car inspector responded and extinguished the fire. preliminary inspection revealed that the high voltage cable on the no. 2 side of the no. 2 truck on car 5168 ignited the truck components and started to spread to the undercarriage of the no. 2 end of the car. there were no employee injuries as a result of the fire. material and labor damages to car 5168 are $41,175.
April 20, 2015	Rail Crash	NS train 294H418 shoving west with 7 units and 5 loads into track #4 in Conrail Oak Island yard struck equipment left in the foul of adjacent track resulting in derailment of TTGX 973823.
May 12, 2015	Rail Crash	Train 2166 with locomotive E/2035 in the lead 6 cars and locomotive E/2039 trailing suffered pantograph damage on both power cars. Amtrak's equipment damage is $17,918.00.
July 17, 2015		FO52 crew was shoving into track 12 and failed to properly protect rear of train and collided with standing cars.

Table 4.3.17-1. Transportation Failure Incidents in Essex County, 2014 to 2019

Date	Type	Description
July 20, 2015	Rail Crash	UP 98513 was humped into track 40 and failed to stop in track. when it exited track 40 it collided with the OI65 crew derailing a total of 4 cars.
August 11, 2015	Rail Crash	On Tuesday, August 11, 2015, at approximately 4:50 AM, an aluminum light pole fell off the new jersey turnpike (i-95) when a truck was involved in a vehicular accident. the pole fell to the path system roadbed, in the vicinity of track H, signal l10x, striking ATC cables and associated equipment.as the cable fell, it bounced off of the messenger wire. The force of the falling pole caused the ATC supporting structures and cable to fall to the ground. when it came to rest, the aluminum pole was obstructing the right-of-way on track h. at 4:55 am the 4:00 am WTC/NWK interval, consist: (W – 5780-5829-5813-5762-5744-5110-5146-5618 - E), was moving west along track h. as it approached the vicinity where the pole fell onto the roadbed, the engineer aboard the train noticed the pole and placed the train into emergency brake. before the train could come to a complete stop, leading car5780 struck the pole. There were no injuries as a result of this incident. there were no damage costs associated with this incident to car equipment, track, and associated components. estimated costs to repair ATC structures and cables is estimated to be $1,300,000. this includes costs for the removal of damaged ATC equipment, and the procurement and installation of ATC equipment.
August 13, 2015	Rail Crash	While humping two sets of cars ran out of the inserts on tracks 18 and track 28 leading to a side swipe and derailment.
August 15, 2015	Aviation Accident	A Cessna T206H lost engine power and crashed soon after takeoff, resulting in one fatality.
September 1, 2015	Rail Crash	NS H80H631 shoving west push/pull with lead unit NS 5613, 4 empties, and trail unit NS 5612 derailed all wheels on trail engine NS 5612 resulting in $24,551 in equipment damages.
September 7, 2015	Rail Crash	Train 664 stopped with a broken pantograph on locomotive E/646 due to fatigue break in auxiliary wire. Amtrak's equipment damage is $20,000.00.
December 8, 2015	Rail Crash	Crew was pulling 8 cars east off track 44 when a covered hopper rolled off track 42 striking the 7th car in train derailing two cars.
2015	Vehicular Accidents	In 2015, as reported by NJDOT, there were 27,267 vehicular accidents in Essex County.
January 30, 2016	Rail Crash	BA50 pulled a 36 car train from east end of oak island track on 1 middle to docks 2, upper bay. While pulling the 26th car, the a end derailed at 1 middle switch resulting in $24,999 in equipment damage, $4,000 track damage.
January 24, 2016	Aviation Accident	Delta Air Lines flight 1409, a McDonnell Douglas MD-88, N908DE, was struck by a Boeing 767, N178DZ, that was under tow by a Delta Airlines ground crew in the vicinity of gate 42 at Newark Liberty International Airport, Newark, New Jersey (EWR). There were no injuries to the 153 passengers and crew members onboard the MD-88 or to the one person aboard the B767 nor to the four ground crew personnel. There was substantial damage to the horizontal stabilizer and elevator of the MD-88.
April 11, 2016	Rail Crash	Train #408 en route east crossed over from track #1 to #2 at green interlocking and pantograph was torn off EMU #1409, #1385 and catenary wire damaged account section insulator failure. $16,932 equipment damage, $4,408 track damage.

Table 4.3.17-1. Transportation Failure Incidents in Essex County, 2014 to 2019

Date	Type	Description
May 25, 2016	Rail Crash	Pantograph on emu #1395 was damaged and bent on the right side while train #308 was en route near MP7.5 in Newark due to section insulator runner failure. $10,500 equipment damage, $1,800 track damage.
June 12, 2016	Rail Crash	FO27 crew shoved the L159-12 after building the train. the FO27 derailed on the southern connection at FRAN as they shoved the train in the clear on track 3. $113,191 in equipment damage, $3,000 track damage.
August 1, 2016	Rail Crash	FO10 derailed cars due to wide gauge resulting in $11,523 equipment damages and $3,500 track damage.
October 21, 2016	Rail Crash	Train #3272 came to rest in a catenary full tension break while train was stopped at a signal. arcing ensued as 1 of the 2 trolley wires forming the break was not touching the pantograph but in very close proximity to it. the resulting heat from the arcing weakened the wire causing it to spark, snag and invert the pantograph as it began to move eastward resulting in $9,000 equipment damage.
November 6, 2016	Rail Crash	FO31 crew were humping cars when the MBLX 28279 sideswiped the SHPX 204819 on track 28. the MBLX was humped into track 26 resulting in $44,981 in equipment damage.
November 12, 2016	Rail Crash	after shoving off a cut of 32 cars on a descending grade only applying 2 hand brakes then cutting away from cars they began to roll away striking another train on east end of yard resulting in $93,647 in equipment damage, $97,843 track damage.
2016	Vehicular Accidents	In 2016, as reported by NJDOT, there were 28,019 vehicular accidents in Essex County.
January 21, 2017	Aviation Accident	During an initial climb from Essex County Airport, a Hawker Beechcraft Corp G36 was substantially damaged when it impacted trees and terrain after a loss of engine power. The pilot was seriously injured.
March 16, 2017	Rail Crash	NJTR crew MM-90 operated locomotive #4509 in electric mode into non-electrified territory with pantograph still raised in the up position, causing pantograph to be completely extended and flip towards rear of locomotive. NJTRS equipment damage is $12,980.00 and the cause of the incident was attributed to NJTRS crew.
May 3, 2017	Rail Crash	Shoving cars into TRK 7 when the lead switch operated under movement. $20,049 equipment damages. $1,500 track damage.
May 14, 2017	Rail Crash	FO05 derailed 3 cars on track 7 when switch threw under movement. $58,364 equipment damage. $1,200 track damage.
July 27, 2017	Rail Crash	NS19G26 crew was doubling departure lead to 2 middle when they shoved through x-over switch then pulled derailing three cars.
July 30, 2017	Rail Crash	FO61 derailed cars due to wide gauge. $51,676 equipment damages. $90,357 track damages.
August 30, 2017	Rail Crash	two loaded hoppers ran out the east end of track 8 class yard into the side of the FO15 that was pulling out of Track 16 on the low side lead. $30,993 in equipment damages.
October 15, 2017	Rail Crash	Q30115 derailed four cars on Conrail track. Conrail damage is 488.60. $83,228 equipment damages.

Table 4.3.17-1. Transportation Failure Incidents in Essex County, 2014 to 2019

Date	Type	Description
December 10, 2017	Rail Crash	While making a double from the main to 1 middle in oak island yard, the S30110 shoved through the track 12 crossover switch, then derailed 5 cars after pulling to depart. Conrail track damage is estimated at $4000.00.
2017	Vehicular Accidents	In 2017, as reported by NJDOT, there were 29,635 vehicular accidents in Essex County.
January 2, 2018	Rail Crash	FO66 shoving cars into track OI 1 departure when cars separated and rolled through a switch. cars then rolled back and derailed. FO66 shoving cars int$14,507 in equipment damages. $7,500 track damages.
September 29, 2018	Rail Crash	Over speed of GIMX trash cars on hump system. $1,273 in equipment damages.
December 2, 2018	Rail Crash	FO18 Hump crew while pulling out of track 24 found cars derailed. $37,094 in equipment damages. $4,500 track damages.
December 30, 2018	Aviation Accident	At the Caldwell Airport, a Cessna 172 ran off the runway, striking a berm and injuring the pilot.

Source: Federal Railroad Administration 2019, NTSB 2019; NJDOT 2018
With transportation failure documentation for Essex County being so extensive, not all sources have been identified or researched; therefore not all events may be included in the table.

Probability of Future Occurrences

Transportation hazards are impossible to accurately predict; however, areas prone to these hazards can be located and quantified through analysis of historical records and plotted on a County base map. Certain characteristics that together cause these hazards or increase the vulnerability of these hazards can be outlined and areas that may be prone are identifiable.

In Section 4.4, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for ranking hazards. Based on historical records and input from the Steering Committee and Planning Committee, the probability of occurrence for transportations hazards in the County is considered 'frequent'.

Climate Change Impacts

Because transportation failure is a human-caused hazard, no climate change impacts are associated with the hazard. Section 4.3.6 (Flood) discusses climate change impacts associated with flood-vulnerable roadways.

4.3.17.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable to the identified hazard. The following discusses Essex County's vulnerability, in a qualitative nature, to the transportation failure hazard.

Impact on Life, Health and Safety

Transit-dependent populations in Essex County include those over 65 and older, disabled, low-income, automobile availability, and unemployment. Persons aged 65 and older are often public transit riders because they are either unable or unwilling to drive. Disabled persons are also another group who depend on public transit. Some disabilities prevent people from driving, making them more dependent on public transit or paratransit. Low-income persons often depend on public transportation because they cannot afford other means of transportation (Essex County Transportation Plan 2008). According to the 2013-2017 ACS 5-Year Estimates, the population of Essex County that commutes to work by public transportation was 76,387 persons which represents approximately 9.5% of the County's population (U.S. Census 2018).

Potential losses from transportation hazards include human health and life, property and natural resources. Vehicular accidents, flooded roadways, aviation accidents and accidents involving trains, all may result in injury or death to drivers/passengers on the road, the public in the immediate vicinity and emergency services personnel. The number of people exposed depends on population density, both by day and night, and on the proportions located indoors and outdoors.

Impact on General Building Stock

Potential losses to the general building stock caused by a transportation failure incident are difficult to quantify. The degree of damages depends on the type and scale of incident. Potential losses include inaccessibility, loss of service, and potential structural and content losses of a building.

Impact on Critical Facilities

Many Essex County residents depend on public transportation to get to work, bring their children to child care facilities, hospitals and senior centers, and to reach other key destinations (Essex County Transportation Plan 2008). Loss of roadway use, and public transportation services would affect thousands of commuters, employment, day-to-day operations within the County, and delivery of critical municipal and emergency services. Disruption of one or more of these modes of transportation can lead to the congestion of another, and

not only impact the County but the State and region as a whole. Refer to Section 3 (County Profile) which summarizes the number and type of critical facilities in Essex County.

Impact on Economy

Due to insufficient data, a full loss estimate was not completed for the transportation hazard. Disruption of transportation services could lead to lost wages. According to the 2013 Essex County Transportation Plan, 52% of Essex County residents worked within Essex County, which ultimately could lead to substantial losses in productivity. Loss of roadway use, and public transportation services would affect thousands of commuters, employment, day-to-day operations within the County, and delivery of critical municipal and emergency services. Key economic contributors in Essex County include: Port of Newark/Elizabeth and Newark Liberty International Airport. The Port assists the County's major economic engine and provides living-wage employment. The Airport employs nearly 24,000 people and contributes to $19 billion in economic activity to the metropolitan area. Disruption of one or more of these modes of transportation can lead to the congestion of another, and not only impact the County and region as a whole.

Future Changes that May Impact Vulnerability

Understanding future changes that impact vulnerability in the county can assist in planning for future development and ensuring that appropriate mitigation, planning, and preparedness measures are in place. The county considered the following factors to examine potential conditions that may affect hazard vulnerability:

- Potential or projected development.
- Projected changes in population.
- Other identified conditions as relevant and appropriate, including the impacts of climate change.

Projected Development and Change in Population

As discussed in Sections 3 and 9, areas targeted for future growth and development have been identified across Essex County. Any areas of growth could be potentially impacted by transportation incidents because the entire County is exposed and vulnerable. An increase in development and population has the ability to increase the likelihood of transportation failure incidents. Future migration to larger jurisdictions may also increase the likelihood of an incident. Please refer to the specific areas of development indicated in tabular form and/or on the hazard maps included in the jurisdictional annexes in Volume II, Section 9 of this plan. Additional development or redevelopment throughout the County could change traffic patterns leading to increased demand on various roadways or lead to a heightened risk for traffic accidents due to a higher number of users on the roadway.

According to population projections from the State of New Jersey Department of Labor and Workforce Development, Essex County will experience an increase in population through 2034 (approximately 40,000 people between 2017 and 2034). Growth in population within the County is expected to bring an increase in the number of user's driving personal vehicles or utilizing public transportation leading to a higher risk for transportation accident to occur.

Climate Change

Because transportation failure is a human-caused hazard, no climate change impacts are associated with the hazard. See Section 4.3.6 (Flood) for climate change impacts on flooding for flood-vulnerable roadways.

Change of Vulnerability Since the 2015 HMP

Overall, the County's vulnerability has not changed, and the entire County will continue to be exposed and vulnerable to transportation failure incidents.