

NJADAPT Hazardous Commercial Facilities Flooding Analysis Update: Using Geographic Tools to identify industrial and commercial facilities for which pollution prevention efforts may reduce exposure to hazards associated with climate-related flooding

Background and Scope

In February 2017 Rutgers completed a geospatial analysis of Industrial and Commercial facilities and flooding. The types of facilities in this analysis included a wide range of sites where pollution prevention could reduce exposure to hazardous substances during climate-related flooding and other events. This current analysis updates portions of the February 2017 analysis focusing on 4 types of sites with hazardous substances/materials. These sites include:

- Known Contaminated Sites List (KCSL)
- Community and Worker Right to Know (CRTK)
- Toxic Catastrophe Prevention Act (TCPA)
- Discharge Prevention Control and Countermeasures (DPCC)

This updated analysis evaluated if these sites are in an area impacted by potential flooding using several current and future flooding scenarios. This updated analysis also identifies whether the sites are in Overburdened Communities (OBC) as defined under the New Jersey Environmental Justice Law.

As with the prior analysis, this updated analysis is limited to data and information that is publicly available. The sites evaluated are covered by various regulatory requirements for planning and response to hazardous substances incidents which often include more detailed data that is sensitive and confidential. The updated analysis does not attempt to duplicate or interfere with these regulatory requirements. It is intended to provide information to increase awareness and assist local planners and other stakeholders that may be involved in emergency planning or response efforts but do not need access to sensitive and confidential information.

Data and Methods

Data for sites with hazardous substances

Data for sites was obtained from the New Jersey Department of Environmental Protection (NJDEP) Open Data website. Table 1 below includes the data sources and access dates for the 4 types of sites evaluated.

Table 2: Data Sources for Sites

Data Source	Date Accessed
Toxic Catastrophe Prevention Act (TCPA) Environmental Justice (EJ) Stressors in New Jersey NJDEP Open Data (arcgis.com)	10/22/2023

Discharge Prevention Containment and Countermeasure (DPCC) Environmental Justice (EJ) Stressors in New Jersey NJDEP Open Data (arcgis.com)	10/22/2023
Community Right to Know Act (CRTK) Environmental Justice (EJ) Stressors in New Jersey NJDEP Open Data (arcgis.com)	10/22/2023
Known Contaminated Site List for New Jersey NJDEP Open Data (arcgis.com)	10/22/2023

While each of these sites contain hazardous materials/substances that may potentially result in exposures during flooding events, there are differences within each regulatory program. These differences are briefly discussed below.

Known Contaminated Sites List (KCSL)

Known Contaminated Sites List (KCSL) are “...those sites and properties within the state where contamination of soil or ground water has been confirmed at levels equal to or greater than applicable standards.” Compared to other sites included in this analysis soil and ground water contamination are key potential exposures to consider during a flooding event.

This analysis is limited to a subset of the approximately 13,597 sites on the KCSL. This subset of facilities meet criteria for Category 2 or 3, which is approximately 1,149 sites. Sites in Category 3 are either federal Superfund sites or sites with Immediate Environmental Concerns (IEC) in progress. An IEC condition is identified when a New Jersey Drinking Water/Ground Water Remediation Standard or a Rapid Action Indoor Air Screening Level is exceeded or a Direct Contact threat exists and a completed pathway between a hazardous substance release and a receptor exists ([NJDEP SRP - Guidance: Immediate Environmental Concern](#)). There are approximately 205 sites in Category 3.

Criteria for Category 2 are based on the government program overseeing remediation activities at the site and generally include sites that are not part of the LSRP program, unless there are over 10 Areas of Concern (AOC). Specifically, category 2 includes sites with a lead of 'BROWNFIELD', 'DIRECT', 'EPA', 'PUB FUNDED', 'TRADITIONA', or 'UNK SOURCE'. Also sites in the LSRP program with more than 10 Areas of Contamination (AOCs) in included in Category 2. There are approximately 944 sites in Category 2.

Sites required to prepare emergency or preparedness plans

These sites are required to prepare emergency or preparedness plans due to the types and quantities of substances manufactured, processed, stored or used. These plans are required under three laws: the Toxic Catastrophe Prevention Act (TCPA), the Community and Worker Right to Know Act (CWRTK), and the Spill Compensation and Control Act. The overall goal of planning is to reduce the possibility of discharges or releases of hazardous substances to the environment and minimize the consequences if they do occur.

TCPA

Facilities in the State of New Jersey where an extraordinarily hazardous substance (EHS) may be present or generated at or above regulatory levels are subject to the Toxic Catastrophe Prevention Act, (N.J.S.A. 13:1K-19 et seq.) and the regulations arising from the Act as codified in N.J.A.C. 7:31. Facilities subject to the TCPA program are required to conduct Process Hazard Analysis (PHA) and Risk Assessment to assess

consequence analysis of toxicity, flammability, explosion, and reactivity hazards. Compared to other sites included in this analysis potential acute health impacts and fires/explosions are key issues to consider during a flooding event.

Discharge Prevention Control and Countermeasures (DPCC)

Pursuant to amendments to the Spill Compensation and Control Act (N.J.S.A. 58:10-23.11(a) et seq.) the NJDEP promulgated the Discharge of Petroleum and Other Hazardous Substances (DPHS) rules (N.J.A.C. 7:1E et seq.), effective September 12, 1991, which provide standards for discharge prevention along with emergency response requirements. These rules contain a number of requirements. One of the primary requirements is that all major facilities in New Jersey prepare and submit DPCC and DCR plans. The majority of the regulatory requirements apply only to facilities that store 20,000 gallons or more of New Jersey-regulated hazardous substances, excluding petroleum products, or 200,000 gallons of regulated hazardous substances including petroleum products.

DPCC stands for Discharge Prevention, Containment and Countermeasure. The purpose of the DPCC plan is to prevent discharges from occurring, and if they do occur, to minimize any effects on the environment. DCR stands for Discharge Cleanup and Removal. The DCR plan addresses what the owner or operator of the facility will do if a discharge does occur in spite of precautions.

Compared to other sites included in this analysis potential spills of hazardous substances are potential issues to consider during a flooding event.

CRTK

Under the New Jersey Community and Worker Right to Know Act (CWRTK) and the federal Emergency Planning and Community Right-to-Know Act Sections 301 to 303 facilities in certain North American Industry Classification System (NAICS) codes with Extremely Hazardous Substances above their assigned threshold planning quantities are required to notify and report information to State Emergency Response Commission (SERC) and local emergency planning committee (LEPC). This includes information on inventories of substances and emergency planning. Local and Tribal Emergency Planning Committees (LEPCs and TEPCs) are responsible for developing and maintaining comprehensive emergency response plans and submitting these plans to the State or Tribal Emergency Response Commission (SERC or TERC). Local or Tribal Emergency Planning Committees (LEPCs or TEPCs) should review the plans annually, or more frequently as circumstances change within the community or at any facility. For additional information on these requirements see [Emergency Planning | US EPA](#).

As discussed in the 2015 Guidance from NJDEP, the goals of these requirements are to:

- Increase community awareness of chemical hazards
- Support and focus state/local planning activities
- Support chemical accident and pollution prevention initiatives

Data Sources for Flooding

Data for flooding scenarios was obtained from the Rutgers SEBS/NJAES Office of Research Analytics which collated data from the Federal Emergency Management Agency and from jointly developed datasets with the New Jersey Department of Environmental Protection (NJDEP). Table 2 below includes the data sources and access dates for the 5 types of flood scenarios evaluated.

Table 2: Data Sources for Flooding

Data Source	Date Accessed
FEMA NFHL Effective FIRM Flood Hazard Zones FEMA Flood Map Service Center	6/21/23
FEMA Preliminary FIRM Flood Hazard Zones FEMA GIS Web Services	6/21/23
Total Water Level 2 ft MHHW NJDEP and Rutgers University Download Link	6/21/23
Total Water Level 5 ft MHHW NJDEP and Rutgers University Download Link	6/21/23
Total Water Level 7 ft MHHW NJDEP and Rutgers University Download Link	6/21/23

Each of these flood scenarios represent different flood hazard risks to sites with hazardous materials/substances. These differences are briefly discussed below.

Federal Emergency Management Agency (FEMA) NFHL Effective and Preliminary FIRM Flood Hazard Zones

FEMA’s National Flood Hazard Layer (NFHL) provides Effective Flood Insurance Rate Maps (FIRM) of flood hazard zones; and Preliminary FIRM flood hazard zones for areas under revision/review. These flood hazard zone maps include areas designated as the Special Flood Hazard Area (SFHA) that represents the 1% annual chance of flooding (100-year flood) and areas that represent the 0.2% annual chance of flooding (500-year flood). These represent current flood risks to these areas.

Coastal Inundation (Total Water Level MHHW)

The Total Water Level (TWL) datasets were created by the New Jersey Department of Environmental Protection and Rutgers University in order to visualize flood exposure risk using the best available science for sea-level rise (SLR) and allowing for the inclusion of future flood hazards that could occur in addition to sea-level rise. Datasets are available in 1-foot increments up to 20 feet of flooding above Mean Higher High Water (MHHW). The TWL method is based on NOAA’s [“What Will Adaptation Cost”](#) guide and is consistent with the 2019 [Science and Technical Advisory Panel](#) report for sea-level rise in New Jersey. This analysis used the 2ft TWL which represents current day high-tide flooding, 5ft TWL which represents the current coastal 100 year storm event roughly, and 7ft TWL which represents current high-tide flooding events occurring on top of the sea-level rise estimate for 2100 (5ft).

The analysis considers “current flooding” risks to be the combination of the FEMA Effective and Preliminary Flood Hazard Areas and the 5 ft TWL MHHW. “Future flooding” is the 7 ft TWL MHHW that is not in current flooding.

OBC data

To implement the New Jersey Environmental Justice Law (N.J.S.A. C.13:1D-157 et. seq.), NJDEP develops data for Overburdened Communities (OBC). An OBC is a census block group that meets the following criteria as determined in accordance with the most recent United States Census:

- at least 35 percent of the households qualify as low-income households
- at least 40 percent of the residents identify as minority or as members of a State recognized tribal community; or
- at least 40 percent of the households have limited English proficiency.35 % poverty

There are 3,511 OBC block groups based on the most recent data.

Table 3: Data Sources for Overburdened Communities (OBC)

Data Source	Date Accessed
Overburdened Communities under the New Jersey Environmental Justice Law 2021 NJDEP Open Data (arcgis.com)	8/10/2023

Methods

Database

All data were downloaded in file geodatabase format (gdb). Data for the sites evaluated are in point format. Coordinates for the points were developed by DEP as included in the public data files. No changes were made to point locations. These locations are intended to generally locate the site and are not specifically linked to locations at the site that may contain hazardous substances/materials. Also, there is no consideration of engineering or other controls that may be in place to protect hazardous substance locations from flooding or other events. This information may be part of more detailed analysis conducted by emergency planners and responders.

Data used as Select layers are in polygon or raster format. The FEMA flooding and OBC data are in polygon format and MHHW data are in raster format.

Python Coding

The analysis was completed using Python coding to document the method and allow easy updating of data. Python version 2.7.18 included with the ArcMap 10.8.1 application from ESRI. As with any coding project there are numerous ways to accomplish the same intended results. The method outlined here is just one way to approach the analysis.

Each of the four site types were evaluated separately. While there is some overlap between these sites (regulated by more than one program) there are sufficient differences between the programs as discussed above that is useful to assess the sites independently.

In general terms, the workflow for the analysis and coding follows a three-step process based on the format of the data and the tasks needed. First, vector format data for OBC and flooding were evaluated using the Select by Location tool. Next, raster format data were evaluated using the Extract Values to Points tool in Spatial Analyst. The final step combines the vector and raster results and appends data to the 4 public files for sites. Table 4 below includes the data fields and a brief description of the results added to the files.

Table 4: Data fields added to the 4 public files

Field Name	Alias	Type	Description
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MUN	Municipality	Text	Name of Municipality determined by Select by Location (intersect) with Municipality data layer
COUNTY	COUNTY	Text	Name of County determined by Select by Location (intersect) with Municipality data layer
MUN_CODE	Municipality Code	Text	Municipal Code determined by Select by Location (intersect) with Municipality data layer
OBC	Overburdened Community	Numeric 1/Null	Result = 1 if site is located in Overburdened Community determined by Select by Location (intersect) with OBC data layer
FEMA_F_1per	FEMA Final 100 yr	Numeric 1/Null	Result = 1 if site is located in FEMA Final 100 yr determined by Select by Location (intersect) with FEMA Final 100 yr data layer
FEMA_P_1per	FEMA Preliminary 100 yr	Numeric 1/Null	Result = 1 if site is located in FEMA Preliminary 100 yr determined by Select by Location (intersect) with FEMA Preliminary 100 yr data layer
FEMA_F_02per	FEMA Final 500 yr	Numeric 1/Null	Result = 1 if site is located in FEMA Final 500 yr determined by Select by Location (intersect) with FEMA Final 500 yr data layer
FEMA_P_02per	FEMA Preliminary 500 yr	Numeric 1/Null	Result = 1 if site is located in FEMA Preliminary 500 yr determined by Select by Location (intersect) with FEMA Preliminary 500 yr data layer
MHHW2ft	Total Water Level 2 ft	Numeric 1/Null	Result = 1 if site is located in MHHW2ft determined by ExtractValuesToPoints with MHHW2ft data layer
MHHW5ft	Total Water Level 5 ft	Numeric 1/Null	Result = 1 if site is located in MHHW5ft determined by ExtractValuesToPoints with MHHW5ft data layer
MHHW7ft	Total Water Level 7 ft	Numeric 1/Null	Result = 1 if site is located in MHHW7ft determined by ExtractValuesToPoints with MHHW7ft data layer
FEMA100	FEMA 100 yr (Final or Preliminary)	Numeric 1/Null	Result = 1 if site is located in either FEMA Final 100 yr or FEMA Preliminary 100 yr determined by combining FEMA_F_1per and FEMA_P_1per fields
FEMA500	FEMA 500 yr (Final or Preliminary)	Numeric 1/Null	Result = 1 if site is located in either FEMA Final 500 yr or FEMA Preliminary 500 yr determined by combining FEMA_F_02per and FEMA_P_02per fields
FEMA100or500	FEMA Any area	Numeric 1/Null	Result = 1 if site is located in any FEMA 100 or 500 zone determined by combining the FEMA100 and FEMA 500 fields
Current	Current Day Flood Risk	Numeric 1/Null	Result = 1 if site is located in either the FEMA100, FEMA 500, MHHW2ft or MHHW5 ft zones
CurrentOBC	Current Day Flood Risk in OBC	Numeric 1/Null	Result = 1 if site is located in the Current flood zone and an OBC
Future	Future Flood Risk	Numeric 1/Null	Result = 1 if site is located in the MHHW7 ft zone and not in Current Day Flood Risk
FutureOBC	Future Flood Risk in OBC	Numeric 1/Null	Result = 1 if site is located in the Future flood zone and an OBC
MappingLabel	MappingLabel	Text	Current Flood Risk In OBC, Current Flood Risk, Future Flood Risk In OBC, Future Flood Risk or None

Results

Flood Risk

Table 5 below provides the results for the four types of sites evaluated and flooding.

- The percentage of sites that may be potentially impacted by current flooding ranged from a high of 38.8% for DPCC sites to a low of 26.3% for CRTK sites.
- Few facilities were found to be potentially impacted by future flooding. Only 17 sites were found to be potentially impacted by future flooding.
 - The percentage of sites that may be potentially impacted by future flooding ranged from 2.3% for TCPA to 0.4% for DPCC.

Table 5: Percent of Sites Potentially Impacted by Current or Future Flooding

Category	KCSL	CRTK	DPCC	TCPA
Current Flood Risk	310 (27.0 %)	107 (25.2%)	93 (37.8%)	24 (27.3%)
Future Flood Risk	10 (0.9%)	4 (0.9%)	1 (0.4%)	2 (2.3%)
Null	829 (72.1%)	310 (73.8%)	152 (61.8%)	62 (70.5%)
TOTAL	1149	421	246	88

Overburdened Communities (OBC)

Table 6 below provides the results for the four types of sites evaluated and OBC block groups.

- For each of the four types evaluated the percentage of sites located in OBC block groups exceeds those located in non OBC block groups.
- The percentage of sites located in an OBC block group ranged from a high of 72.8% for DPCC sites to a low of 58.8% for CRTK sites.

Table 6: Percent of Sites in Overburdened Communities (OBC)

Category	KCSL	CRTK	DPCC	TCPA
In OBC	676 (58.8 %)	267 (63.4%)	179 (72.8%)	54 (61.4%)
Not in OBC	473 (41.2%)	154 (36.6%)	67 (27.2%)	34 (38.6%)
TOTAL	1149	421	246	88

Flood Risk and Overburdened Communities

Table 7 below provides the results for the four types of sites evaluated that are potentially impacted by flooding and whether they are in an OBC block group.

- The percentage of sites potentially impacted by current flooding that are also located in an OBC ranged from a high of 84.9% for DPCC sites to a low of 70.8% for TCPA sites.
- Few sites are impacted by future flooding. However, all 10 KCSL sites impacted by future flooding are located in an OBC block group.
 - 8 of the 10 are located in Newark.

Table 7: Percent of Sites Potentially Impacted by Current or Future Flooding and OBC

Category	KCSL	CRTK	DPCC	TCPA
Current Flood Risk In OBC	240 (77.4%)	82 (76.6%)	79 (84.9%)	17 (70.8%)
Current Flood Risk Not in OBC	70 (22.6%)	25 (23.4%)	14 (15.1%)	7 (29.2%)
TOTAL Current Flood Risk	310	107	93	24
Future Flood Risk In OBC	10 (100%)	2 (50.0%)	1 (100%)	(0%)
Future Flood Risk Not in OBC	(0%)	2 (50.0%)	(0%)	2 (100%)
TOTAL Future Flood Risk	10	4	1	2