

SUMMIT Products and Data Outputs to Support Exercise Scenarios

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Intended Audience: FEMA National Exercise Division (NED)

Document Purpose: To provide a listing of available products and outputs available for the Standard Unified Modeling and Mapping Integration Toolkit (SUMMIT) through the National Exercise Simulation Center (NESC).

The following document contains a summary listing of modeling and simulation results that could be used to support the following hazard types for exercises:

- Earthquake
- Hurricane
- Tsunami
- Chemical Release (Chlorine Rail Tank)
- Biological (Anthrax) Release

The SUMMIT library of models is constantly evolving and will eventually be able to support a larger set of hazards for the NED to utilize for exercise support. However, the current capabilities are limited to the hazards identified above. NESC staff can support your exercises by providing modeling interpretation expertise and assistance incorporating modeling and simulation data into the design and conduct of your exercise. The following tables will provide the exercise planner a description of each category of consideration with related modeling and simulation outputs.

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SUMMIT Products to Support an Earthquake Exercise

Category	SUMMIT Products
Shelter Needs	<ul style="list-style-type: none"> • An accumulation of all populations requiring shelter <ul style="list-style-type: none"> ○ Visualized in GIS by census tract
Shelter Needs	<ul style="list-style-type: none"> • Tables for shelter needs broken down by county
Points of Distribution (POD)	<ul style="list-style-type: none"> • Numbers of total PODs necessary based on numbers of potentially displaced populations <ul style="list-style-type: none"> ○ POD Type – I, II, and III ○ Visualized in a table
Points of Distribution	<ul style="list-style-type: none"> • Total units by equipment type necessary to operate all POD types <ul style="list-style-type: none"> ○ Forklifts, pallet jacks, power lights, toilets, dumpsters, traffic cones, radios ○ Visualized in a table
Points of Distribution	<ul style="list-style-type: none"> • Total manpower necessary to operate all POD <ul style="list-style-type: none"> ○ Manager, team leader, forklift operator, loading point, backups, pallet jack operator, law enforcement personnel, community relations staff ○ Visualized in a table
Debris	<ul style="list-style-type: none"> • Total tons of debris <ul style="list-style-type: none"> ○ Visualized in GIS by census tract
Debris	<ul style="list-style-type: none"> • Tables for tons of debris broken down by county
Commodities	<ul style="list-style-type: none"> • Commodities necessary to support sheltering operations and debris removal <ul style="list-style-type: none"> ○ Truckloads to move debris, water, MREs, tarps, and ice as well as associated gallons of fuel ○ Visualized in a table
Infrastructure	<ul style="list-style-type: none"> • Damage counts of buildings <ul style="list-style-type: none"> ○ Total damaged ○ Counts by damage category (slight, moderate, extensive, complete) ○ Probability of damage by damage category <ul style="list-style-type: none"> ▪ Visualized in GIS by census tract
Infrastructure	<ul style="list-style-type: none"> • Probability of damage for critical facilities <ul style="list-style-type: none"> ○ Emergency operations centers, fire stations, hospitals, military bases, police stations, schools, PODs, shelters ○ Damage probabilities: none, slight, moderate, extensive, complete ○ Functionalities based on period of time following tsunami (day 1, 3, 7, 14, 30, 90 – percent of utility that is functional)
Infrastructure	<ul style="list-style-type: none"> • The ability to view the modeled damage on individual buildings in a given area by damage categories (slight, moderate, extensive, complete, collapsed) • An associated ability to adjudicate/edit damage on a specific building to further drive exercise play (e.g. ability to change damage from a slightly to completely damaged building)



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Casualties	<ul style="list-style-type: none"> • Total casualties in a selected census tract <ul style="list-style-type: none"> ○ Counts by triage level (green, yellow, red, black) ○ Percentage of total casualties by triage level <ul style="list-style-type: none"> ▪ Visualized in GIS by census tract
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SUMMIT Products to Support a Hurricane Exercise

Category	SUMMIT Products
Shelter Needs	<ul style="list-style-type: none"> • Displaced households and populations requiring shelter based separately on wind and flood <ul style="list-style-type: none"> ○ Visualized in GIS by census tract ○ Accumulation of wind and flood shelter needs represented as an overall number requiring shelter by census tract
Shelter Needs	<ul style="list-style-type: none"> • Shelter needs broken down by county <ul style="list-style-type: none"> ○ Visualized in table by county ○ Can be viewed separately by flood and wind hazards or as an accumulation
Points of Distribution (POD)	<ul style="list-style-type: none"> • Number of total PODs based on displaced persons <ul style="list-style-type: none"> ○ POD Type – I, II, and III ○ Visualized in a table
Points of Distribution	<ul style="list-style-type: none"> • Total units by equipment type necessary to operate all POD types <ul style="list-style-type: none"> ○ Forklifts, pallet jacks, power lights, toilets, dumpsters, traffic cones, radios ○ Visualized in a table
Points of Distribution	<ul style="list-style-type: none"> • Total manpower necessary to operate all POD types <ul style="list-style-type: none"> ○ Manager, team leader, forklift operator, loading point, backups, pallet jack operator, law enforcement personnel, community relations staff ○ Visualized in table
Debris	<ul style="list-style-type: none"> • Total tons of debris displayed by flood or wind hazard or as an accumulation <ul style="list-style-type: none"> ○ Visualized in GIS by census tract ○ Visualized in table by county
Debris Type	<ul style="list-style-type: none"> • Total tons of debris separated into “building debris” and “tree debris” categories <ul style="list-style-type: none"> ○ Visualized in GIS by census tract ○ Visualized separately by flood or wind hazard or as an accumulation
Commodities	<ul style="list-style-type: none"> • Commodities necessary to support sheltering operations and debris removal <ul style="list-style-type: none"> ○ Truckloads to move debris, water, MREs, tarps, and ice as well as associated gallons of fuel ○ Visualized in a table
Infrastructure	<ul style="list-style-type: none"> • Probability of damage based on flood or wind separately <ul style="list-style-type: none"> ○ Damage probabilities: none, slight, moderate, extensive, complete ○ Counts and percentages of the total buildings ○ Critical infrastructure layer to include EOCs, hospitals, schools, police, fire <ul style="list-style-type: none"> ▪ Probability of damage and number of days inability to use ▪ Ability to sort by all utilities or only those deemed non-functional ○ Visualized in GIS layers

<p>Infrastructure – Loss Estimates</p>	<ul style="list-style-type: none"> • Total losses (monetary value) comprised of building losses, content losses, and inventory losses. Infrastructure loss calculated separately for flood and wind hazard or as an accumulation <ul style="list-style-type: none"> ○ Generates a building exposure cost (total replacement) and building loss ratio ○ Visualized in a table by county ○ Building loss ratio also visualized in GIS by census tract
<p>Infrastructure – Building Damage</p>	<ul style="list-style-type: none"> • The ability to view the modeled damage on individual buildings <ul style="list-style-type: none"> ○ Categories: slight, moderate, extensive, complete, collapsed ○ Available for selected areas with building footprint data • An associated ability to adjudicate/edit damage on a specific building to further drive exercise play (e.g. ability to change damage from a slightly to completely damaged building)
<p>Utilities</p>	<ul style="list-style-type: none"> • Utility functionality <ul style="list-style-type: none"> ○ Total counts of households in selected census tract who are without power or water; based on period of time following hurricane (no power/water– day 1, 3, 7, 14, 30) ○ Probability of damage to communications facilities, electric power stations, natural gas facilities, potable water, wastewater facilities; functionalities based on period of time following hurricane (day 1, 3, 7, 14, 30, 90– percent of utility that is functional)

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SUMMIT Products to Support a Tsunami Exercise

Category	SUMMIT Products
Shelter Needs	<ul style="list-style-type: none"> • Populations requiring shelter based separately on the earthquake damage and flood • An accumulation of all populations requiring shelter based on both earthquake and flood <ul style="list-style-type: none"> ○ Visualized in GIS by census tract
Shelter Needs	<ul style="list-style-type: none"> • Tables for shelter needs broken down by county - can be separate by earthquake and flood or viewed as an accumulation
Points of Distribution (POD)	<ul style="list-style-type: none"> • Numbers of total PODs necessary based on numbers of potentially displaced populations <ul style="list-style-type: none"> ○ POD Type – I, II, and III ○ Visualized in table
Points of Distribution	<ul style="list-style-type: none"> • Total units by equipment type necessary to operate all POD types <ul style="list-style-type: none"> ○ Forklifts, pallet jacks, power lights, toilets, dumpsters, traffic cones, radios ○ Visualized in table
Points of Distribution	<ul style="list-style-type: none"> • Total manpower necessary to operate all POD <ul style="list-style-type: none"> ○ Manager, team leader, forklift operator, loading point, backups, pallet jack operator, law enforcement personnel, community relations staff ○ Visualized in table
Debris	<ul style="list-style-type: none"> • Total tons of debris broken down by earthquake or flood <ul style="list-style-type: none"> ○ Visualized in GIS by census tract
Debris	<ul style="list-style-type: none"> • Tables for tons of debris broken down by county - can be separate by earthquake and flood or viewed as an accumulation
Commodities	<ul style="list-style-type: none"> • Commodities necessary to support sheltering operations and debris removal <ul style="list-style-type: none"> ○ Truckloads to move debris, water, MREs, tarps, and ice as well as associated gallons of fuel ○ Visualized in table
Infrastructure	<ul style="list-style-type: none"> • Damage counts of buildings separated by flood and earthquake effects <ul style="list-style-type: none"> ○ Total damaged ○ Counts by damage category (slight, moderate, extensive, complete) ○ Probability of damage by damage category <ul style="list-style-type: none"> ▪ Visualized in GIS by census tract
Infrastructure	<ul style="list-style-type: none"> • Probability of damage based on earthquake, flood, or cumulative of both hazards <ul style="list-style-type: none"> ○ Emergency operations centers, fire stations, hospitals, military bases, police stations, schools, PODs, shelters ○ Damage probabilities: none, slight, moderate, extensive, complete ○ Functionalities based on period of time following tsunami (day 1, 3, 7, 14, 30, 90 – percent of utility that is functional)

Infrastructure	<ul style="list-style-type: none"> • The ability to view the modeled damage on individual buildings in a given area by damage categories (slight, moderate, extensive, complete, collapsed) • An associated ability to adjudicate/edit damage on a specific building to further drive exercise play (e.g. the ability to change damage from a slightly damaged building to complete damage)
Casualties	<ul style="list-style-type: none"> • Total casualties in a selected census tract <ul style="list-style-type: none"> ○ Counts by triage level (green, yellow, red, black) ○ Percentage of total casualties by triage level <ul style="list-style-type: none"> ▪ Visualized in GIS by census tract
Utilities	<ul style="list-style-type: none"> • Total counts of households in selected census tract who are without power or water based on earthquake effects <ul style="list-style-type: none"> ○ Total counts are based on period of time following quake (no power/water – day 1, 3, 7, 14, 30)
Utilities	<ul style="list-style-type: none"> • Probability of damage based on earthquake, flood, or cumulative of both hazards <ul style="list-style-type: none"> ○ Communications facilities, electric power stations, natural gas facilities, potable water, wastewater facilities ○ Damage probabilities: none, slight, moderate, extensive, complete ○ Functionalities based on period of time following tsunami (day 1, 3, 7, 14, 30, 90 – percent of utility that is functional)
Ground acceleration	<ul style="list-style-type: none"> • Approximate acceleration measured in g units (equivalent to g-force) experienced by a building with a natural period of 0.3s (less than 7 stories).

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SUMMIT Products to a Chlorine Rail Tanker Release Exercise

Category	SUMMIT Products
Area Potentially Impacted	<ul style="list-style-type: none"> • Threshold exposure limits for the general public applicable to the emergency exposure periods ranging from 10 minutes to 8 hours <ul style="list-style-type: none"> ○ Visualized in GIS by AEGL (Acute Exposure Guideline Levels) contours ○ Generated for event location
Casualty Estimates (i.e. Population Effects)	<ul style="list-style-type: none"> • Estimation of the total number of casualties <ul style="list-style-type: none"> ○ Visualized in table according to AEGL level (AEGL 1, 2, and 3) ○ Generated for event location
Hospital Surge	<ul style="list-style-type: none"> • Reports the total number of beds needed, beds available and beds unavailable for area hospitals <ul style="list-style-type: none"> ○ Visualized in a table and a graph
Medical Needs Comparison	<ul style="list-style-type: none"> • Health care resource surge requirements for staff and equipment <ul style="list-style-type: none"> ○ Example resource categories include: Hospital Capacity, Hospital Equipment, Hospital Pharmacy, and Hospital Staff ○ Visualized in multiple tables by resource category

SUMMIT Products to Support an Aerosolized Anthrax Release Exercise

Category	SUMMIT Products
Plume model	<ul style="list-style-type: none"> HPAC model with displayed GIS contours of probability of infection. Contours are displayed in the following probability of infection categories (1%, 10%, 20%, 30%). <ul style="list-style-type: none"> Execute with a single point source release or a straight-line release Inputs: release location, size (kg) of release, direction and length (line release), speed, and date/time
	<ul style="list-style-type: none"> Total number of infections at the various probabilities (1%, 10%, 20%, 30%) <ul style="list-style-type: none"> Visualized as charts and tables
Population Movement	<ul style="list-style-type: none"> Distribution of a population after a release has occurred <ul style="list-style-type: none"> For example, if a covert release were to occur, the population would still either go home at night or to work the next day Model allows visualization of the distribution of those who were exposed 12 hours following the release
	<ul style="list-style-type: none"> Distribution of population 12 hours after release can be broken down by census tract
Hospital Resources	<ul style="list-style-type: none"> Necessary resources for hospitals to effectively respond given casualty estimate <ul style="list-style-type: none"> Visualized as charts and tables
	<ul style="list-style-type: none"> Total numbers of casualties for hospitals over 48 days. <ul style="list-style-type: none"> Total numbers of patients and estimated fatalities (assuming no prophylaxis)
	<ul style="list-style-type: none"> Daily beds needed by hospitals <ul style="list-style-type: none"> Total number over 30 days following exposure.
	<ul style="list-style-type: none"> Hospital (total) equipment and supplies necessary to respond to the casualty estimate. <ul style="list-style-type: none"> Outputs include: ICU beds, medical/surgical beds, ventilators, oxygen monitoring equipment, PPE, ventilator equipment, hemodynamic medications, IV fluids.
	<ul style="list-style-type: none"> Hospital (total) staffing necessary to respond to casualty estimate. <ul style="list-style-type: none"> Outputs include: RN/LPN, MDs, pharmacists, psychologists, radiologic technicians, respiratory therapists, surgeons
Affected Critical Facilities	<ul style="list-style-type: none"> Visual display of facilities within the plume or located within proximity of where populations moved 12 hours after the release. <ul style="list-style-type: none"> Hospitals, fire stations, police stations, and stadiums
Point of Dispensing (POD) Resources	<ul style="list-style-type: none"> Resources necessary to provide operate PODs for the mass dispensing of oral antibiotics <ul style="list-style-type: none"> Based on estimated number of infected/exposed
	<ul style="list-style-type: none"> Total number of PODs necessary, based on the user-defined flow rate and target population to treat per day (length of dispensing campaign is user-defined)
	<ul style="list-style-type: none"> Total required staff (core and support) for each clinic and total for the campaign <ul style="list-style-type: none"> Pre-define number of clinic shifts Pre-define clinic downtimes



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	<ul style="list-style-type: none"> Core staffing outputs include: greeters, form distributors, triage staff, medical evaluators, crisis counselors, briefing supervisors, drug triage staff, express drug staff, pharmacists, form collectors, transporters/EMTs
	<ul style="list-style-type: none"> Support staff outputs include: security, station managers, data entry operators, information technologists, medicine resupply staff, EMS, other

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