PDC25 Epoch 2 Damage Risk Maps Content Key

This document outlines the contents of the Google Earth KMZ package of damage risk maps generated for Epoch 2 of the PDC25 Hypothetical Asteroid Impact Exercise.

PDC25 Epoch 2 Damage Risk Maps [EXERCISE ONLY]

*****HYPOTHETICAL EXERCISE ONLY*****
These maps represent asteroid impact damage estimates modeled for the **PDC25 Hypothetical Asteroid Impact Exercise**, as part of the 9th AIAA Planetary Defense Conference (PDC 2025). This exercise assesses a realistic but fictitious hypothetical scenario, not a real asteroid threat.

DAMAGE RISK MAP OVERVIEW & CONTENTS:
These damage risk maps represent the potential range of local ground damage that could occur given the ranges of potential asteroid sizes, properties, and impact locations in the current scenario. This map set includes a damage risk swath covering the combined extent of regions that could potentially be at risk to damage, and examples of various damage footprint sizes over sample locations. These different swath and footprint examples can be displayed or hidden on the globe map by expanding and selecting different elements in the navigation panel folders. Information on each example set can be seen by clicking on the folder in the navigation panel.

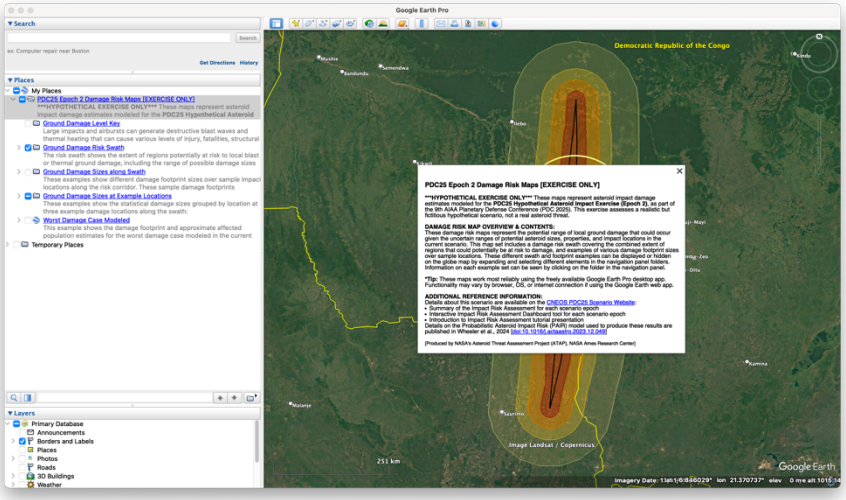
***Tip:** These maps work most reliably using the freely available Google Earth Pro desktop app. Functionality may vary by browser, OS, or internet connection if using the Google Earth web app.

ADDITIONAL REFERENCE INFORMATION:
Details about this scenario are available on the CNEOS PDC25 Scenario Website:

- Summary of the **Impact Risk Assessment** for each scenario epoch
- Interactive **Impact Risk Assessment Dashboard** tool for each scenario epoch
- **Introduction to Impact Risk Assessment** tutorial presentation

Details on the Probabilistic Asteroid Impact Risk (PAIR) model used to produce these results are published in **Wheeler et al., 2024** [doi:10.1016/j.actaastro.2023.12.049]

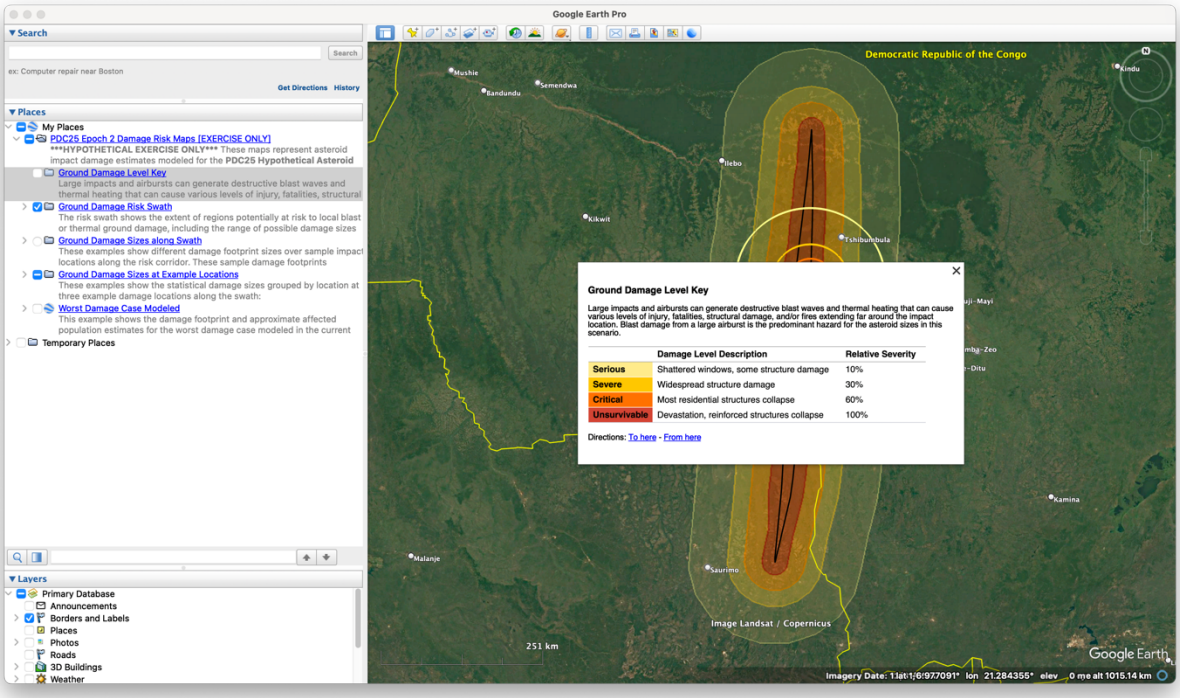
[Produced by NASA's Asteroid Threat Assessment Project (ATAP), NASA Ames Research Center]



Ground Damage Level Key

Large impacts and airbursts can generate destructive blast waves and thermal heating that can cause various levels of injury, fatalities, structural damage, and/or fires extending far around the impact location. Blast damage from a large airburst is the predominant hazard for the asteroid sizes in this scenario.

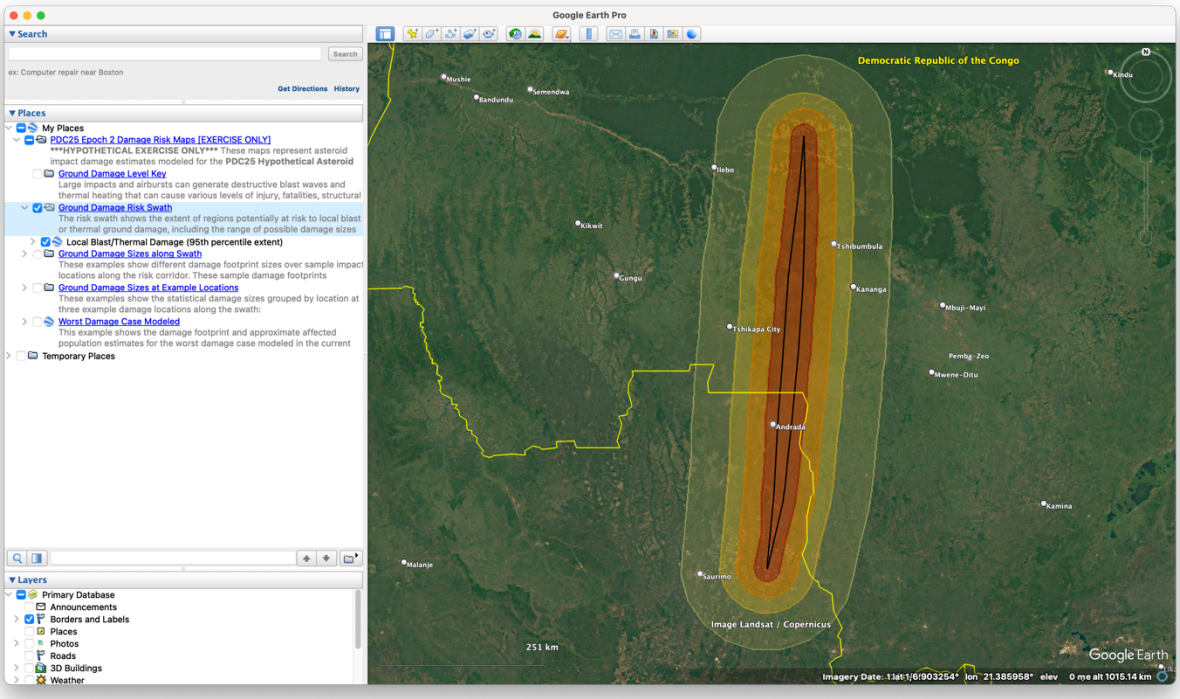
	Damage Level Description	Relative Severity
Serious	Shattered windows, some structure damage	10%
Severe	Widespread structure damage	30%
Critical	Most residential structures collapse	60%
Unsurvivable	Devastation, reinforced structures collapse	100%



Ground Damage Risk Swath

The risk swath shows the extent of regions potentially at risk to local ground damage, including the range of possible damage sizes and possible airburst/impact locations. The black border bounds the range of airburst/impact locations modeled, and the shaded regions show the potential extent of damage around those locations, colored by the highest potential damage severity level. This risk swath shows the extent of local blast damage out to the 95th percentile of possible damage sizes.

Additional information on these damage risk swath maps is provided in the Introduction to Impact Risk Assessment presentation on the CNEOS PDC25 Scenario Website.

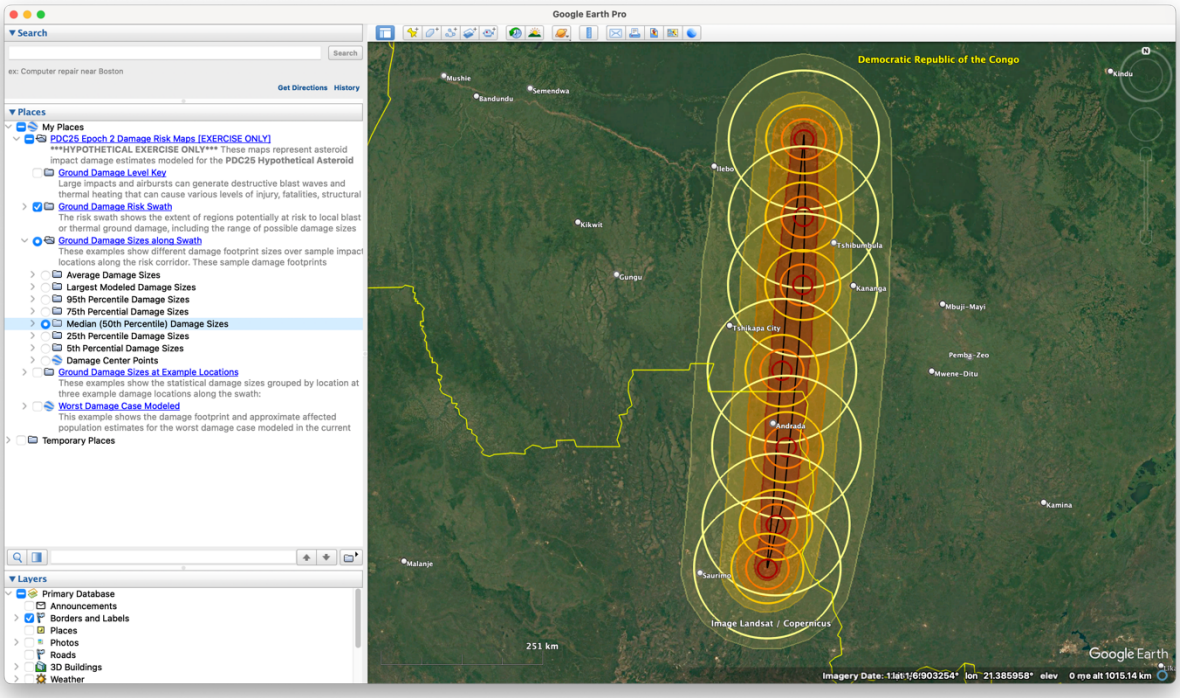


Ground Damage Sizes along Swath

These examples show different damage footprint sizes over sample impact locations along the risk corridor. These sample damage footprints represent the generalized damage size statistics among the impact cases modeled within a given impact region, rather than damage from a specific impact case.

Statistical damage sizes:
Damage size percentiles indicate the likelihood that the damage could be up to the given size or smaller when considering all the potential impact cases modeled (e.g., the 95th percentile footprints show damage sizes that are larger than 95% of the modeled cases and, conversely, smaller than 5% of the modeled cases. The largest sizes represent the largest *damage* among the probabilistically sampled set of cases *modeled* (not necessarily theoretical maximums or largest asteroid cases). The damage sizes and shapes vary between locations due to the different entry angles along the corridor.

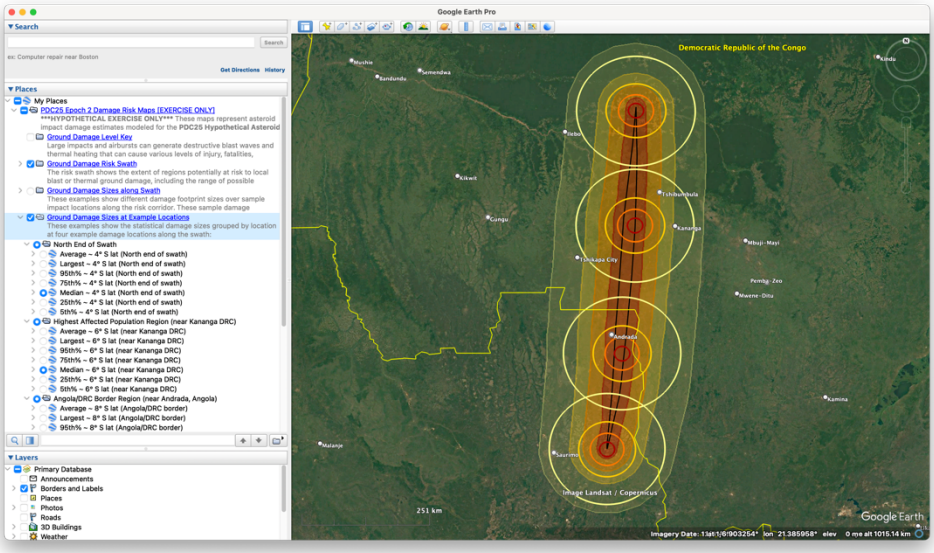
Sample footprint locations:
The sample damage locations shown represent some of the higher-population damage locations within each region along the swath. The locations were selected based on the highest population damage estimated for a median-sized outer damage area within 1° latitude increments. The highest population region along this swath span is around 6° S latitude, near Kananga DRC, and populations decrease moving further outward toward either end of the swath.

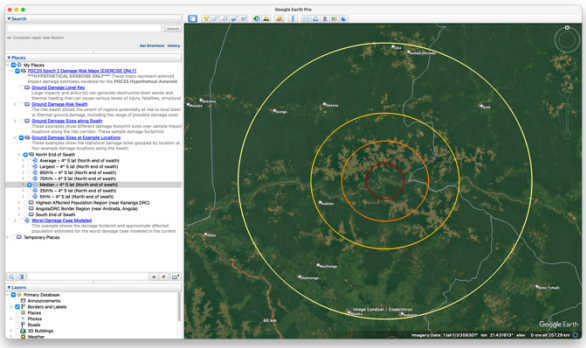


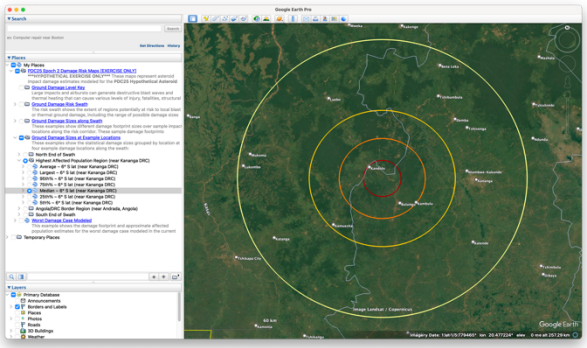
Ground Damage Sizes at High Population Regions

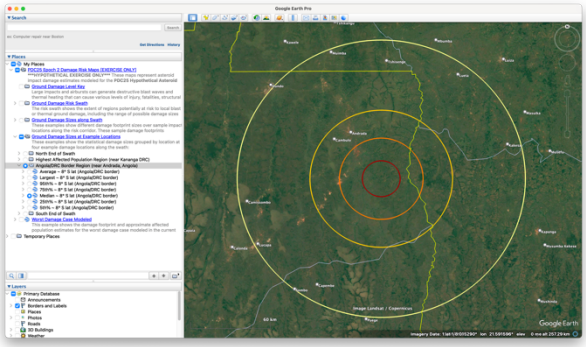
These examples show the statistical damage sizes grouped by location at the highest-population damage location, a location near the border of Angola and the Democratic Republic of the Congo, and at the north and south ends of the impact region:

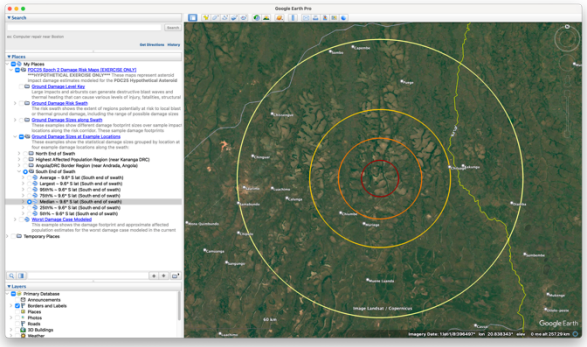
- North end of the swath
- Highest population damage region, near Kananga, DRC
- Angola/DRC border region, near Andrada, Angola
- South end of the swath











Worst Damage Case Modeled

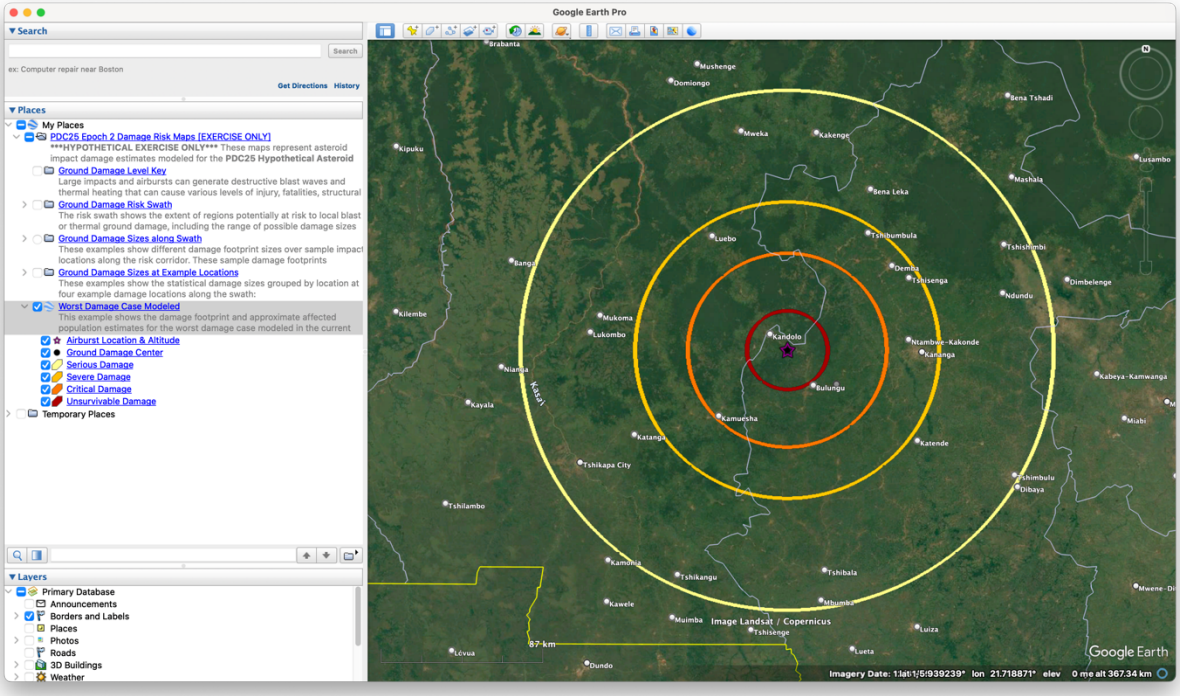
This example shows the damage footprint and approximate affected population estimates for the worst damage case modeled in the current scenario set. Additional details can be seen by clicking on each damage level on the map or navigation pane. (Tip: hiding the risk swath layer can make it easier to click on specific damage footprint areas).

Damage estimates:
- Total estimated population in damage area: ~6M people
- Affected population damage estimate: ~1.3M people
- Damage area: ~15,100 sq. km (~5,830 sq. mi)
- Damage level radii: serious ~140 km, severe ~80 km, critical ~50 km, unsurvivable ~20 km

Asteroid Properties:
- Diameter 153m (spherical equivalent)
- Energy 135 Mt
- Mass 6e9 kg
- Bulk density 3209 kg/m^3
- Aerodynamic strength 3.3 MPa

Entry Properties:
- Entry angle 68.1°
- Entry velocity 13.72 km/s
- Entry flight heading ~0° (northward)

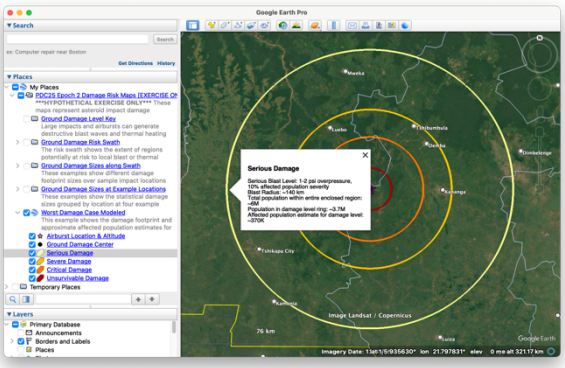
Effective Airburst Estimate:
- Altitude ~8.7 km
- Blast energy 135 Mt



Worst Damage Case Damage Level Subfolders:

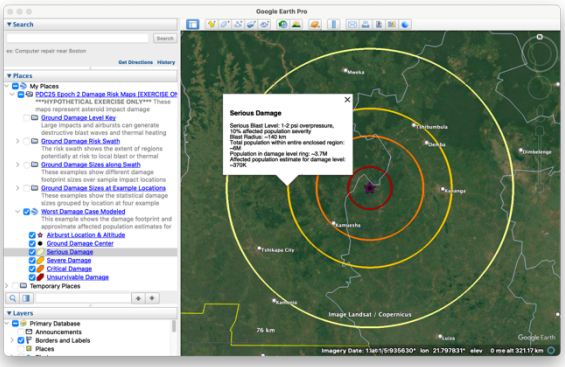
Serious Damage

Serious blast level: 1-2 psi overpressure, 10% affected population severity
Blast radius: ~140 km
Total population within entire enclosed region: ~6M
Population in damage level ring: ~3.7M
Affected population estimate for damage level: ~370K



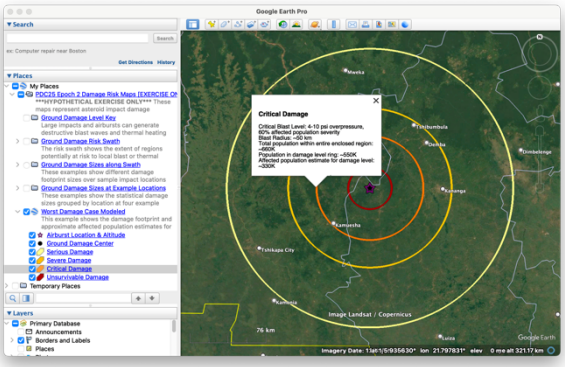
Severe Damage

Severe blast level: 2-4 psi overpressure, 30% affected population severity
Blast radius: ~80 km
Total population within entire enclosed region: ~2.4M
Population in damage level ring: ~1.8M
Affected population estimate for damage level: ~530K



Critical Damage

Critical blast level: 4-10 psi overpressure, 60% affected population severity
Blast radius: ~50 km
Total population within entire enclosed region: ~660K
Population in damage level ring: ~550K
Affected population estimate for damage level: ~330K



Unsurvivable Damage

Unsurvivable blast level: >10 psi overpressure, 100% affected population severity
Blast radius: ~20 km
Total population within enclosed region: ~100K
Population in damage level: ~100K
Affected population estimate for damage level: ~100K