



# RUBIN OBSERVATORY & NEAR-EARTH OBJECTS

The 2005 Congressional mandate to NASA calls for discovery of Near-Earth Objects (NEO) with a completeness of 90% down to diameters of D=140m by 2020. Rubin Observatory expects to begin survey operations in 2024 and can make a major contribution to the completeness requirement.

Given the planned ten years of operation of the survey and our baseline cadence, which was designed to optimize observations for a diverse set of science goals, we expect to be able to obtain orbits for about 61% of NEOs larger than D=140m, with the uncertainty in the estimate of  $\pm 5$  percentage points (Jones et al. 2017, arXiv:1711.10621; Veres and Chesley 2017, *Astronomical Journal* 154, 12).

With modifications of this baseline cadence, some improvements to processing software, and by extending the survey by two additional years, the completeness can be significantly increased. With objects discovered by other contemporaneous surveys taken into account, the anticipated completeness for potentially hazardous objects (PHAs) larger than 140m would reach 86% (77% for NEOs) in 2034.

## National Academy of Sciences Report:

*Near-Earth Object Surveys and Hazard Mitigation Strategies*, a 2010 study by the National Academy of Sciences, found the 2020 deadline to be unrealistic and concluded that a ground-based telescope, like Rubin Observatory, should be part of the solution if either cost conservation or survey completion date was considered more important:

### Finding:

If **cost conservation** is deemed more important, the **use of a large ground-based telescope** is the better approach. Under this option, the survey could not be completed by the original 2020 deadline, but it could be completed before 2034. To achieve the intended cost-effectiveness, the funding to construct the telescope must come largely on the basis of non-NEO programs.

If the **completion of the survey** as close as possible to the original 2020 deadline is considered more important, **a space mission conducted in concert with observations using a suitable ground-based telescope** and selected by peer-reviewed competition is the better approach. This combination could complete the survey well before 2030, perhaps as early as 2024 if funding were appropriated quickly.

### Finding:

The mandated survey to locate 90 percent of near-earth objects 140 meters or greater in diameter has not yet been funded by the federal government. Because the survey requires several years for budgeting and for the building of new equipment and then for conducting the search, **completion by 2020 is not realistic.**

