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IDENTIFYING SHORT-TERM IMPACTORS WITH LSST

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ABSTRACT

The Large Synoptic Survey Telescope (LSST) is a wide-field survey telescope with an 8.4 m primary mirror that is expected to start operations by 2023. One of the LSST objectives is to discover and catalog near-Earth objects (NEOs), including potential Earth impacting asteroids. The baseline survey of LSST would visit a given field twice per night probably yielding two detections for an NEO in the field of view. Under a nominal survey strategy, it would take detections on three nights spanning about two weeks to discover and catalog a previously unknown NEO. However, smaller objects would likely be discovered closer to Earth and could make a close approach or even reach the Earth in shorter time scales. At discovery, these small objects would be moving relatively fast in the sky and so these detections could be streaked. Each streak would provide two astrometric positions corresponding to the trail ends yielding four positions in a single night. These four positions can allow a statistical assessment of the close approach circumstances. In this study, we simulate the detection of Earth impacting asteroids using the Survey Simulation software currently under development at the Jet Propulsion Laboratory (Naidu et al. 2017). This tool inputs user-defined asteroid population models and telescope parameters such as a list of pointings and camera field-of-view, and outputs a list of asteroid detections. We use a synthetic Earth impacting asteroid population that was

developed by Chesley et al. (2018) and is based on the recent Granvik et al. (2018) NEO population model. We will test different survey strategies under consideration by the LSST project. We will extract the astrometric measurements from each streaked detection and pass it through the JPL Scout system (Farnocchia et al. 2015, Farnocchia et al. 2016), which provides trajectory analysis and hazard assessment for short observation arcs. We will analyze the results and estimate the efficiency of various survey strategies for identifying short-term Earth impacting asteroids.

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