Uplift of the basement-cored Wind River Mountains during the Laramide orogeny (ca. 75-45 Ma) produced a series of en echelon NW-SE trending basin margin folds along the southwestern margin of the Wind River basin. The orientation of these subsidiary folds trend subparallel to the Wind River uplift and are consistent with the regional NE-SW Laramide shortening that produced the uplift. However, more recent studies have identified variation in the orientations of structures within individual folds and within the interchange zones along the fold trend. These studies provide evidence for a potential late-stage shift in shortening directions from NE-SW to N-S during the later stages of the Laramide orogeny. Similar evidence for N-S shortening occurs along the northern closure of Hudson Dome and McGowan Anticline, within the Lander NW Quadrangle.

From its southern closure, Hudson Dome maintains a moderate NW orientation, roughly consistent with the regional ~NE-SW Laramide shortening. However, the overall fold geometry and axial trace of Hudson Dome is complex along the northern part of the dome. The dome and its axial trace are folded about a series of younger WNW-striking fold axial traces, consistent with the late-stage N-S shortening recognized in the fold interchange zones to the south. Two major WNW-trending axial traces, McGowan Anticline and an adjacent syncline, occur within the Cretaceous Cody Shale immediately east of the refolded Hudson axial trace. These folds are also consistent with late-stage ~N-S shortening.

Fracture patterns along the southern portion of Hudson Dome indicate overall consistency with the regional Laramide stress field. However, variations in principal stress orientations along the major refolded segments of the axial trace are evident in the northern portion of the fold. These data indicate a shift in Laramide paleostress orientation from the regional ~NE-SW compression to a local N-S shortening component. Localized reactivation and reorientation of early fractures and the orientation of shear bands are also consistent with both the regional NE-SW and local N-S shortening directions.

Results from geologic mapping, paleostress analysis and 3D modelling of the major deformation features within the LNW study area are all consistent with a shift from regional NE-SW to N-S directed shortening. The complex and variable trend of the northern portion of Hudson Dome’s axial trace, ~WNW-trending adjacent folds, and rotation of principal stress orientations derived from the fracture analysis are interpreted to have been affected by later stages of the Laramide orogeny.