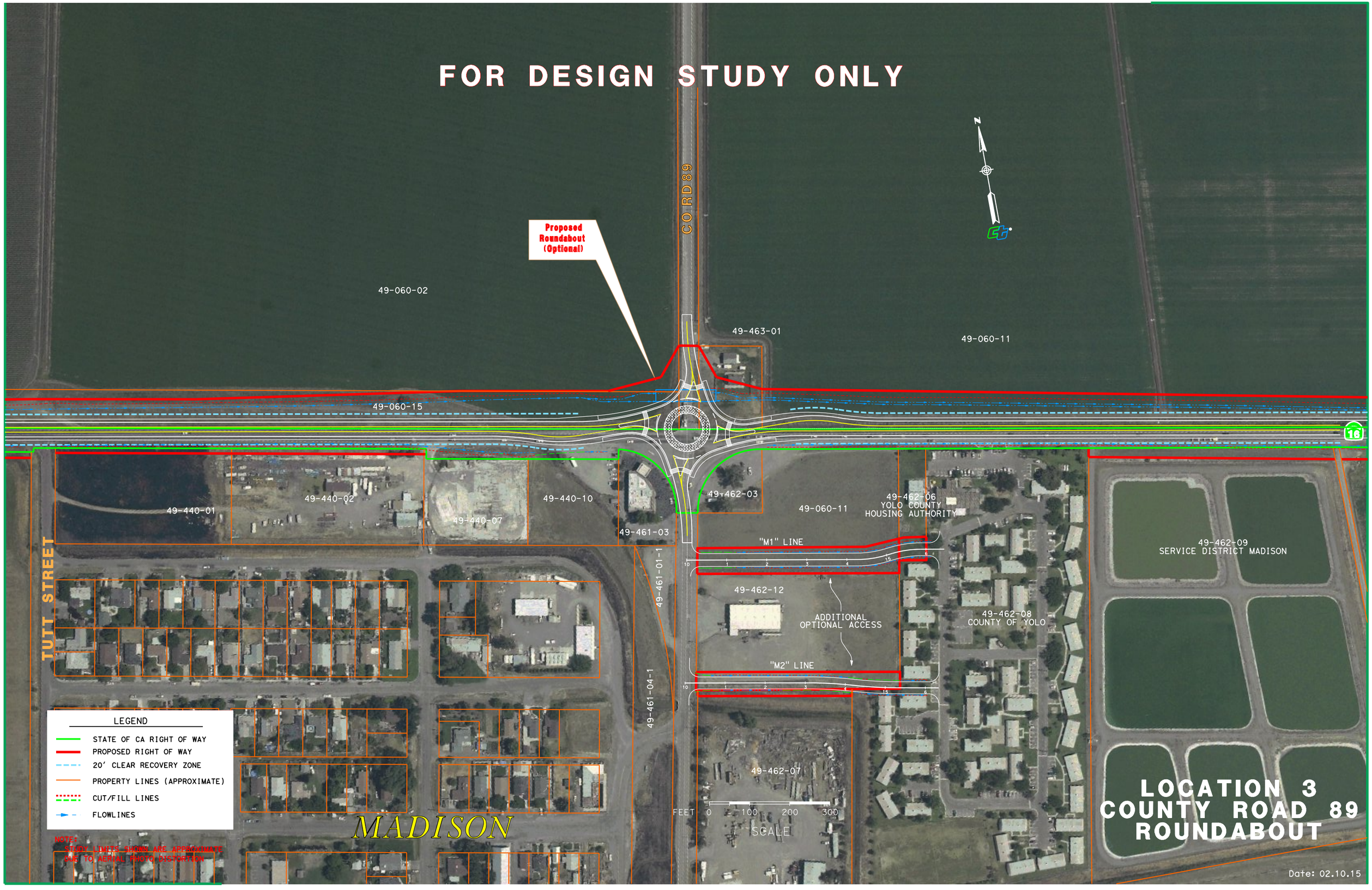FOR DESIGN STUDY ONLY