# UNKNOWN FOUNDATIONS GUIDANCE - LEVEL A EVALUATION

The National Bridge Inspection Standards (NBIS) regulation, 23 CFR 650.313, requires that bridge owners identify bridges that have Item 113, Scour Critical, coded as 0, 1, 2, or 3; and to prepare a Plan of Action (POA) to monitor known and potential deficiencies.

FHWA has previously provided guidance for bridge owners on development and implementation of POA's for bridges determined to be scour critical. For bridges with unknown foundations, a bridge owner has two options for development of a POA:

1. A bridge with Item 113, Scour Critical, coded U can simply be changed to a scour critical code (e.g., 3) for the NBI and subjected to a POA as described for scour critical bridges.

2. A bridge with Item 113, Scour Critical, may remain coded U with a POA developed based on a risk assessment and bridge owner defined criteria considering known information about the bridge.

The POA for a bridge with Item 113, Scour Critical, that remains coded U may be different than for a bridge determined to be scour critical. The POA developed should be based on the known information of the bridge and the bridge owner determined risk from scour. The POA for a bridge over waterways with unknown foundations should contain minimum requirements commensurate to the consequences of loss of service of the structure to ensure a reasonable level of safety to the traveling public.

The steps below provide assistance to bridge owners in developing a POA for a bridge with Item 113, Scour Critical, coded U:

STEP 1:
Assess bridges with unknown foundations in accordance with guidance provided in this IM and examples provided on the Unknown Foundations website. For bridges with Item 113, Scour Critical that remains coded U after a risk-based assessment, FHWA recommends that a POA be developed based on the risk categories defined by bridge owners during initial categorization and grouping (e.g. A - High Risk, B - Moderate Risk, C - Low Risk).

STEP 2:
Develop a POA based upon the defined risk category that considers safety to the traveling public and the consequences of loss of service of the structure. The POA may be less detailed than for a scour critical bridge based on the defined risk categories, but it should contain elements that protect users during and after a scour event, and provide a proactive plan for addressing the bridge scour concerns in the future. Examples for lowest and highest risk categories are below.

A. Lowest Risk Categories:

Assumes that the bridge has performed well and has no history of scour related problems.

For bridges considered as low risk, the POA may be as simple as monitoring bridges for scour during routine biennial inspections and after major events.

If scour or a rainfall event has been observed in excess of predetermined monitoring triggers, then the bridge should be considered for an in-depth foundation investigation. Any information on observed or inspected conditions would be identified on the bridge inspection report so that inspectors could monitor the bridge for changes.

B. Moderate Risk Categories:

Assumes that the bridge has performed satisfactorily, but because of bridge owner defined criteria, it has been identified as moderate risk.

For bridges considered moderate risk, the POA may be similar to those for bridges determined to be scour critical. At a minimum, the bridge should be monitored on a more frequent basis than a bridge in a low risk category.

A bridge in this category should be considered for an in-depth foundation investigation if scour or a rainfall event has been observed for at least a magnitude equal to predetermined monitoring triggers. If significant changes in streambed continue to occur, countermeasures should be considered to make the bridge safe from scour and stream instability.

C. Highest Risk Categories:

Assumes that the bridge has performed satisfactorily, but because of bridge owner defined criteria, it has been identified as high risk.

POA may be similar to those for bridges determined to be scour critical. At a minimum, the bridge should be monitored on a more frequent basis than a bridge in a moderate to low risk category. Also, a bridge in this category should be considered for an in-depth foundation investigation if any significant changes in streambed occur, and scheduled for timely design and construction of a new bridge or countermeasures to make the bridge safe from scour and stream instability.

STEP 3:
Coordinate a global action plan for all bridges with Item 113, Scour Critical, coded U within a LPA, whether assessed through this guidance or not. The plan should:

1. Identify the scour critical and unknown foundation bridges;

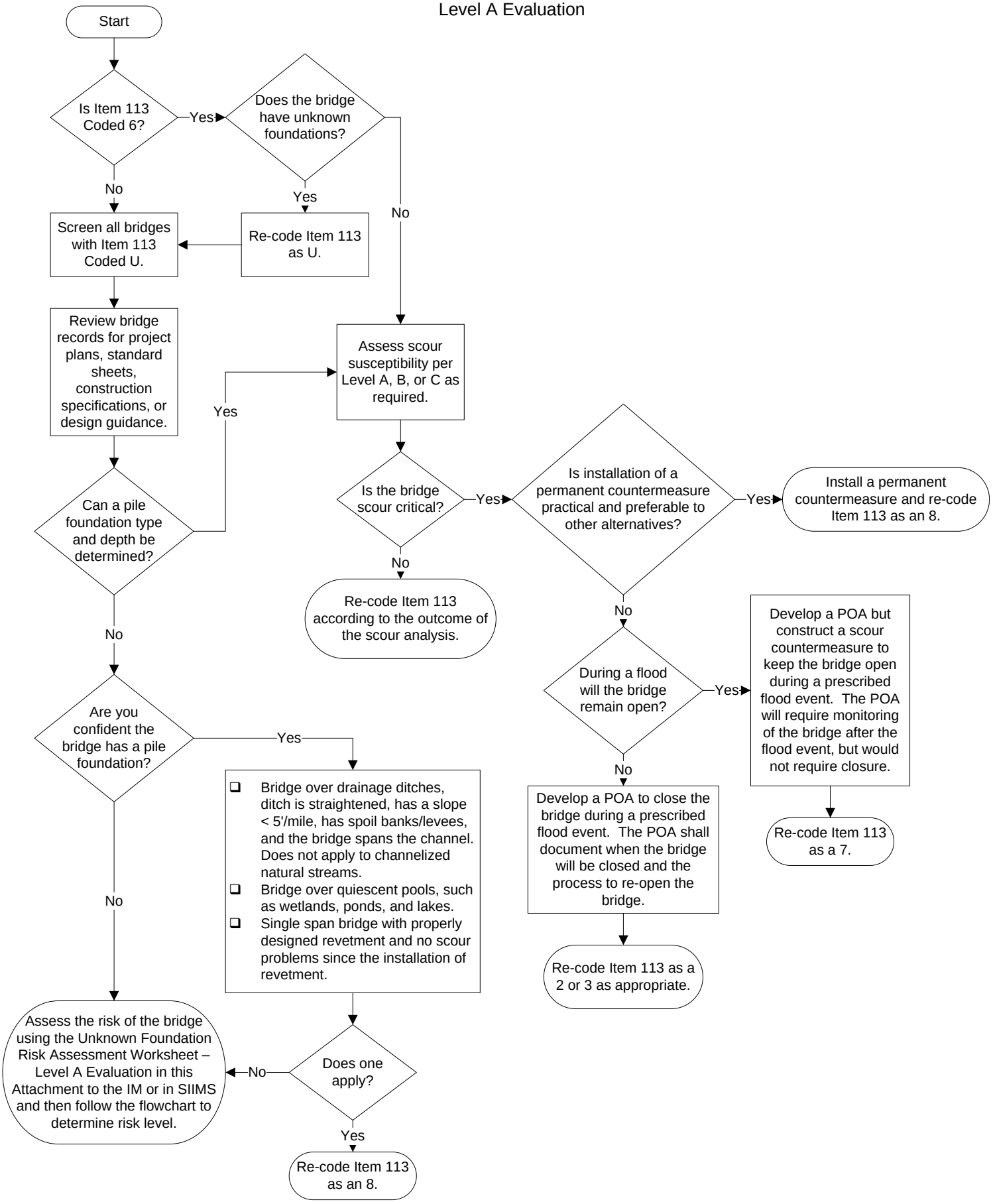
2. Define major events or monitoring trigger; and

3. Provide information for requesting technical assistance or conducting an in-depth foundation investigation.

Bridge owners should monitor and verify that the process of implementing POAs is working satisfactorily. The global action plan for developing and implementing POAs should be revisited and updated as necessary.

# UNKNOWN FOUNDATIONS FLOWCHART

Level A Evaluation




Abbreviations:
POA = Plan of Action

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**UNKNOWN FOUNDATION RISK ASSESSMENT WORKSHEET - LEVEL A EVALUATION**

Name: _____ Date: _____

Bridge ID: _____ County / City: _____

FHWA No.: _____ ADT: _____

Main Span Materials & Design (Item 43): _____

Location: _____

For each numbered question enter the number of points into the blank at the right. If more than one answer applies, use the answer with the highest number of points. Each question should be answered. Structures with risk assessment totals equal to or less than 25 points can be considered "Low" risk, 26 to 29 points can be considered "Moderate" risk, and greater than or equal to 30 points can be considered "High" risk.

| | POINTS | POINTS GIVEN |
|---|---|---|
| 1. Superstructure type: | | |
| A. Continuous | 2 | |
| B. Multi-span | 4 | |
| C. Fracture critical | 8 | |
| D. Single span | 8 | |
| E. High concrete abutments | 10 | _____ |
| 2. Item 60, Substructure coding: | | |
| A. 7 to 9 | 1 | |
| B. 5 or 6 | 2 | |
| C. 1 to 4 | 3 | _____ |
| 3. Item 61, Channel/Channel Protection coding: | | |
| A. 7 to 9 | 1 | |
| B. 5 or 6 | 2 | |
| C. 1 to 4 | 3 | _____ |

4. Geomorphology/hydrology:

The USGS publication Water Resource Investigation Report 8704132 defines a Hydrologic Region based on the slope of the topography and has equations that estimate the flood discharge. Utilize the USGS Region map (Attachment G to this I.M.) and the drainage for each structure in conjunction with the following guidelines to determine whether a bridge is "Low", "Moderate", or "High" risk for this category.

Caution: Within each region there are small watersheds that have topography which produces runoff characteristics of another region. Utilize the region that best represents the area in which the watershed lies.

| | | |
|---|---|---|
| A. Hydrologic Region 1 | | |
| 1) < 5 square miles | 2 | |
| 2) 5 to 30 square miles | 4 | |
| 3) > 30 square miles | 6 | _____ |
| B. Hydrologic Region 2 | | |
| 1) < 15 square miles | 2 | |
| 2) 15 to 100 square miles | 4 | |
| 3) > 100 square miles | 6 | _____ |
| C. Hydrologic Region 3 | | |
| 1) < 30 square miles | 2 | |
| 2) 30 to 225 square miles | 4 | |
| 3) > 225 square miles | 6 | _____ |
| D. Hydrologic Region 4 and 5 | | |
| 1) < 100 square miles | 2 | |
| 2) 100 to 600 square miles | 4 | |
| 3) > 600 square miles | 6 | _____ |

5. Topography:

| | | |
|---|---|---|
| A. Hydrologic Region 4 and 5 | 2 | |
| B. Hydrologic Region 3 | 4 | |
| C. Hydrologic Region 1 and 2 | 6 | _____ |

6. Item 26, Functional Class:

| | | |
|---|---|---|
| A. Level B road | 1 | |
| B. Local road/minor arterial | 2 | |
| C. Farm to Market | 3 | |
| D. Urban Arterial | 4 | _____ |

7. Item 19, Detour Length:

| | | |
|---|---|---|
| A. < 4 miles | 1 | |
| B. 4 to 10 miles | 2 | |
| C. >10 miles | 3 | _____ |

8. Item 29, Average Daily Traffic (ADT):

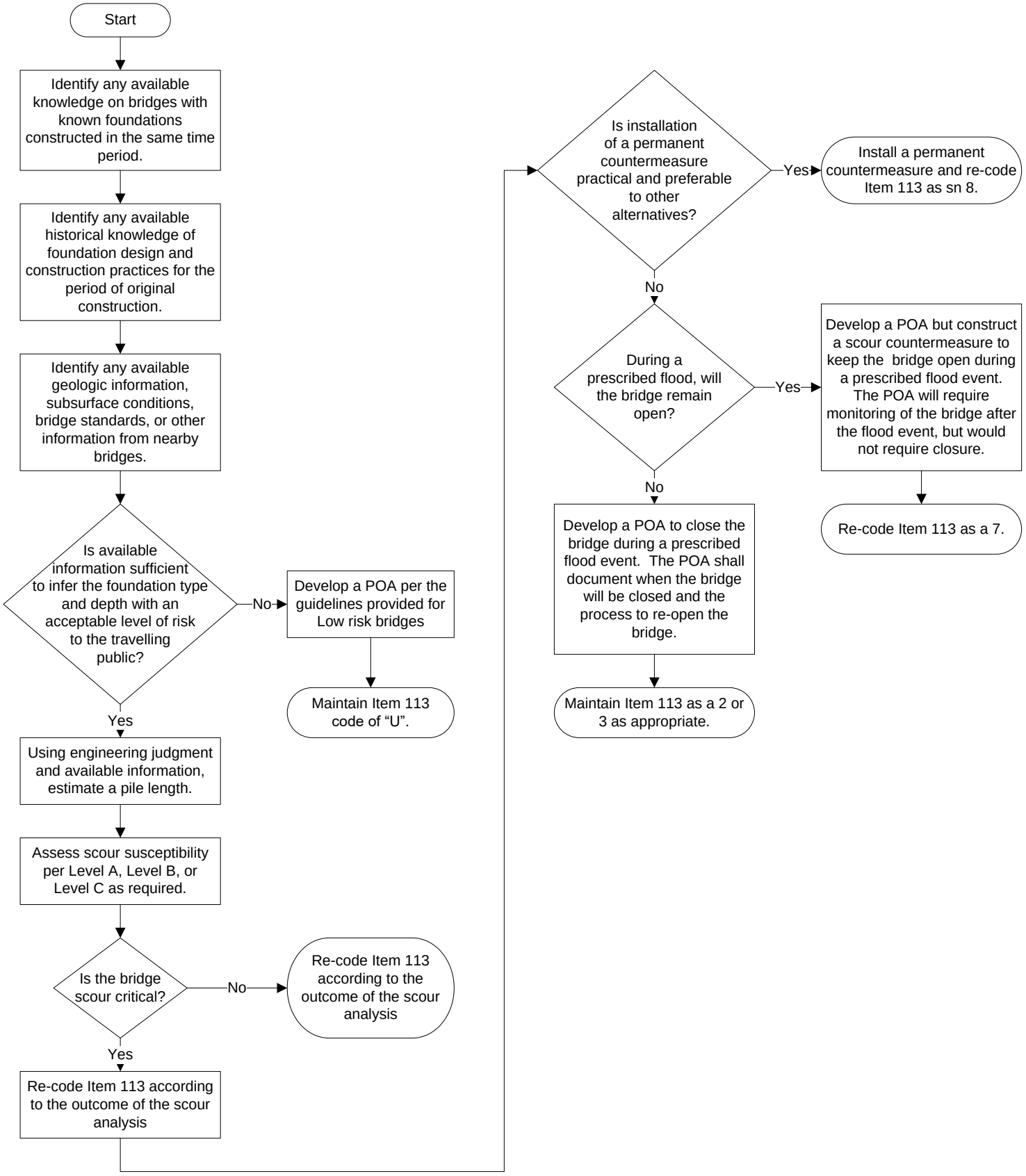
| | | |
|---|---|---|
| A. < 26 | 2 | |
| B. 26 to 50 | 4 | |
| D. > 50 | 6 | _____ |

RISK ASSESSMENT TOTAL _____

**Secondary Level of Assessment:**

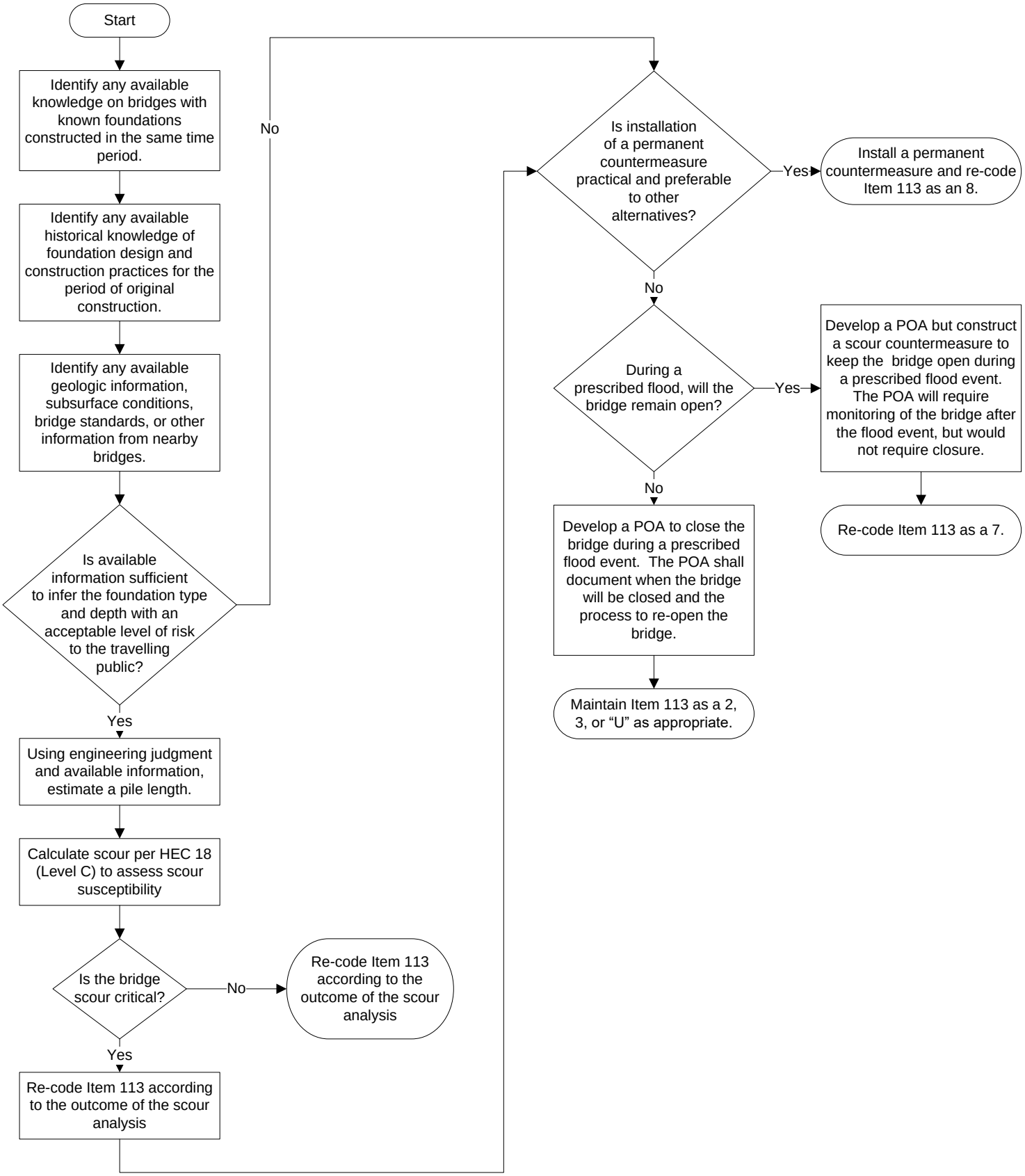
Structures determined to have “Moderate” or “High” risk unknown foundations based on the Risk Assessment Total above, may utilize the Unknown Foundations Assessment Flowchart - Level B Evaluation (Attachment I to this I.M.) to determine if the category of risk can be reduced.

# UNKNOWN FOUNDATIONS LOW RISK FLOWCHART



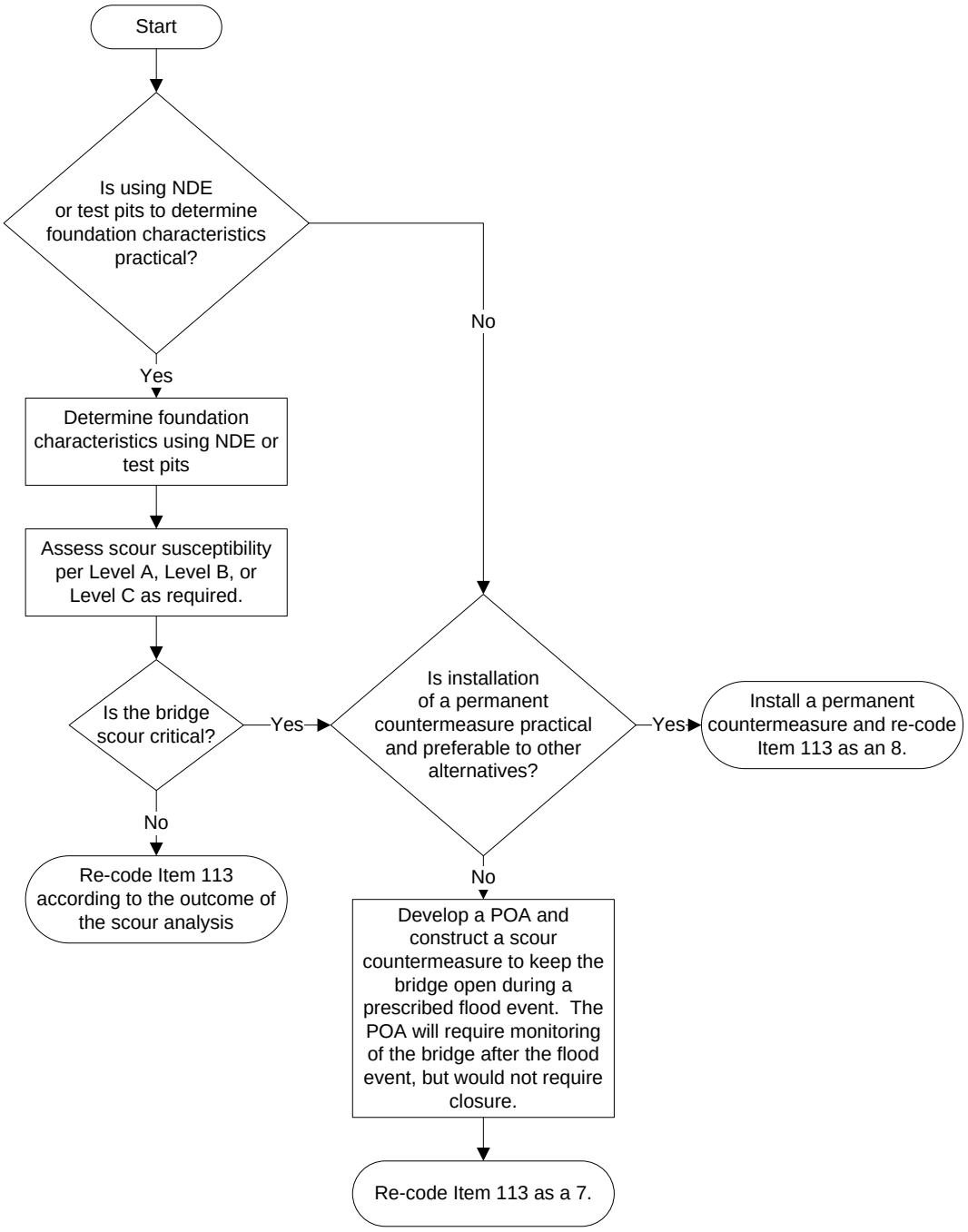

Abbreviations:
POA = Plan of Action

# UNKNOWN FOUNDATIONS MODERATE RISK FLOWCHART




Abbreviations:
POA = Plan of Action

# UNKNOWN FOUNDATIONS HIGH RISK FLOWCHART




Abbreviations:
POA = Plan of Action
NDE = Non-distructive Evaluation