



**US Army Corps
of Engineers**
Sacramento District

SACRAMENTO DISTRICT FLOOD DAMAGE REDUCTION SEGMENT INSPECTION FLOWCHART

This flowchart was created by the Flood Protection and Navigation Section of the U.S. Army Corps of Engineers (USACE) Sacramento District (SPK) in consultation with the Geotechnical Engineering Branch (SPK). The Department of Water Resources also worked with the Flood Project and Navigation Section to clarify the checklist in creating the inspection flow chart. The intention is to aid USACE inspectors, Department of Water Resource inspectors and contractors to rate levee segments which are a part of the Rehabilitation and Inspection Program in a consistent manner which meets the standards defined by the USACE checklist. This flowchart quantifies the items in the checklist and is intended to improve consistency among inspectors, but it is not intended replace common sense, engineering judgment or the wording used in the checklist.

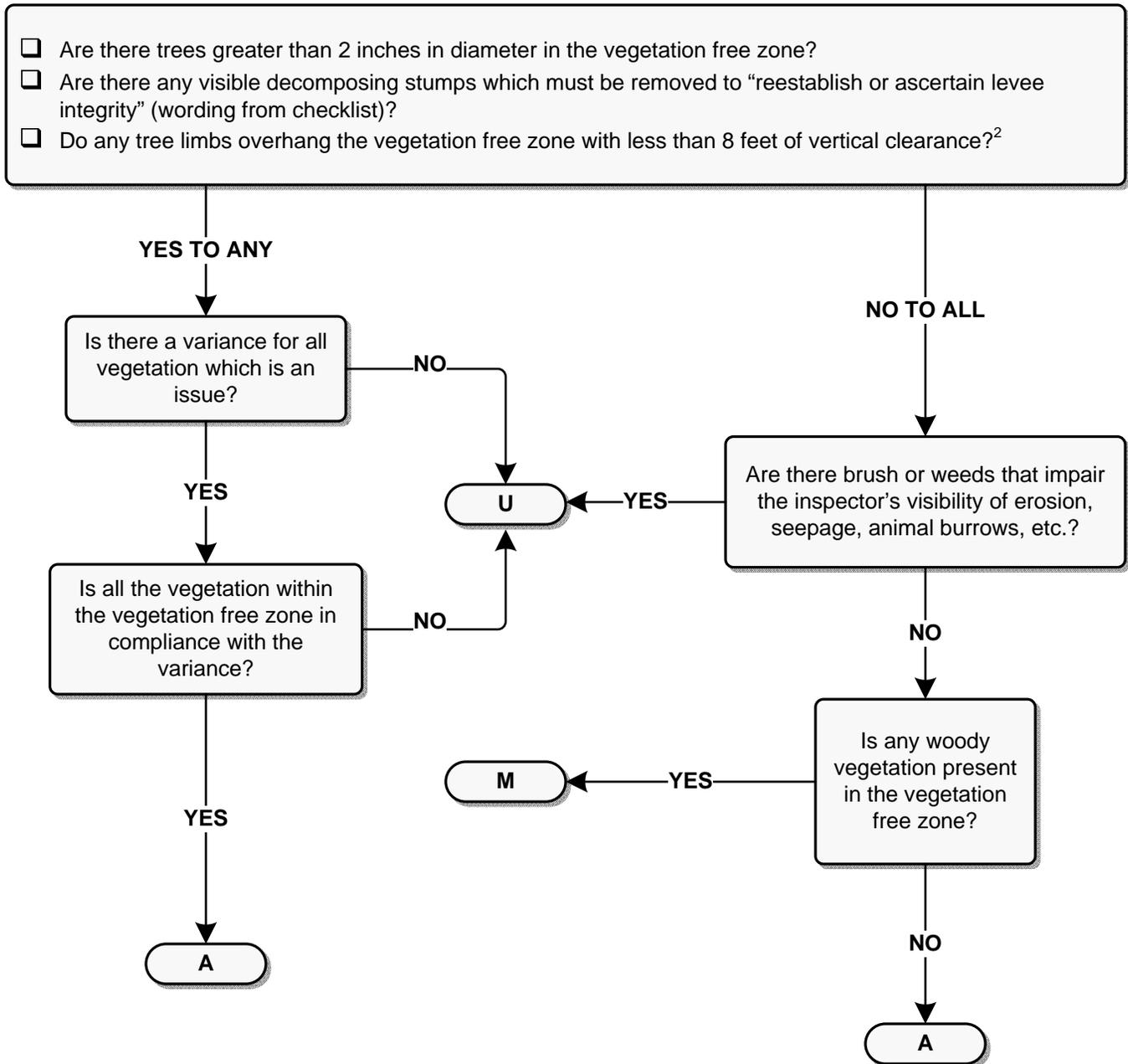
In the future the flowchart can serve as a more accessible way to explain to the local maintainers of the project exactly what they need to do to get the desired rating on a given item.

It is the responsibility of the sponsor to provide a map of the easement area, without such a map, or reasonable justification, it will be assumed that the easement area extends 15 ft from the landside levee toe.

1. UNWANTED VEGETATION GROWTH

Revised 13 August 2012

The vegetation free zone is described in the USACE checklist as an area which “extends 15 feet from both the landside and riverside levee toes to the centerline of the tree. If the levee access easement doesn’t extend to the described limits, then the vegetation free zone must be maintained to the easement limits.” Reference ETL 1110-2-571¹ for more details.



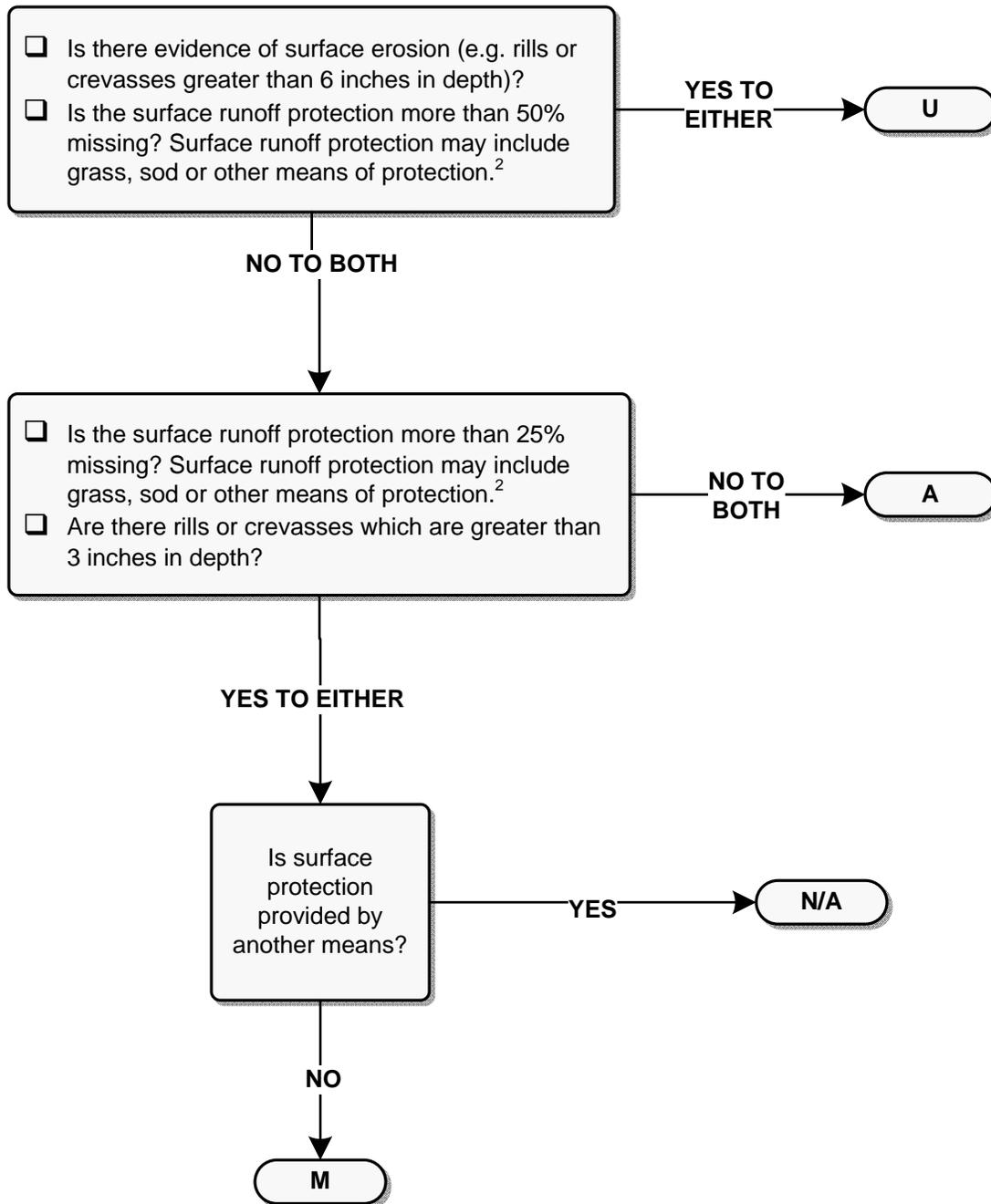
▪ Stumps and fallen trees should be recorded under vegetation.

¹ <http://140.194.76.129/publications/index.html>

² If the only instance of overhanging limbs is from a newly planted tree that is confined within the 4' X 7' transition zone, refer to ETL 1110-2-571 for additional guidance.

2. SOD COVER¹

09 July 2013 Revision



¹ "Sod Cover" for the purposes of the Sacramento District Flood Damage Reduction Segment Inspection Flowchart refers to the surface runoff protection of the levee slopes to protect against surface erosion. This includes rating the levee for erosion caused by surface runoff.

² If the vegetation height impairs the inspector's visibility of the levee slopes, this should be rated "U" under Item 1 – Unwanted Vegetation Growth

3. ENCROACHMENTS¹

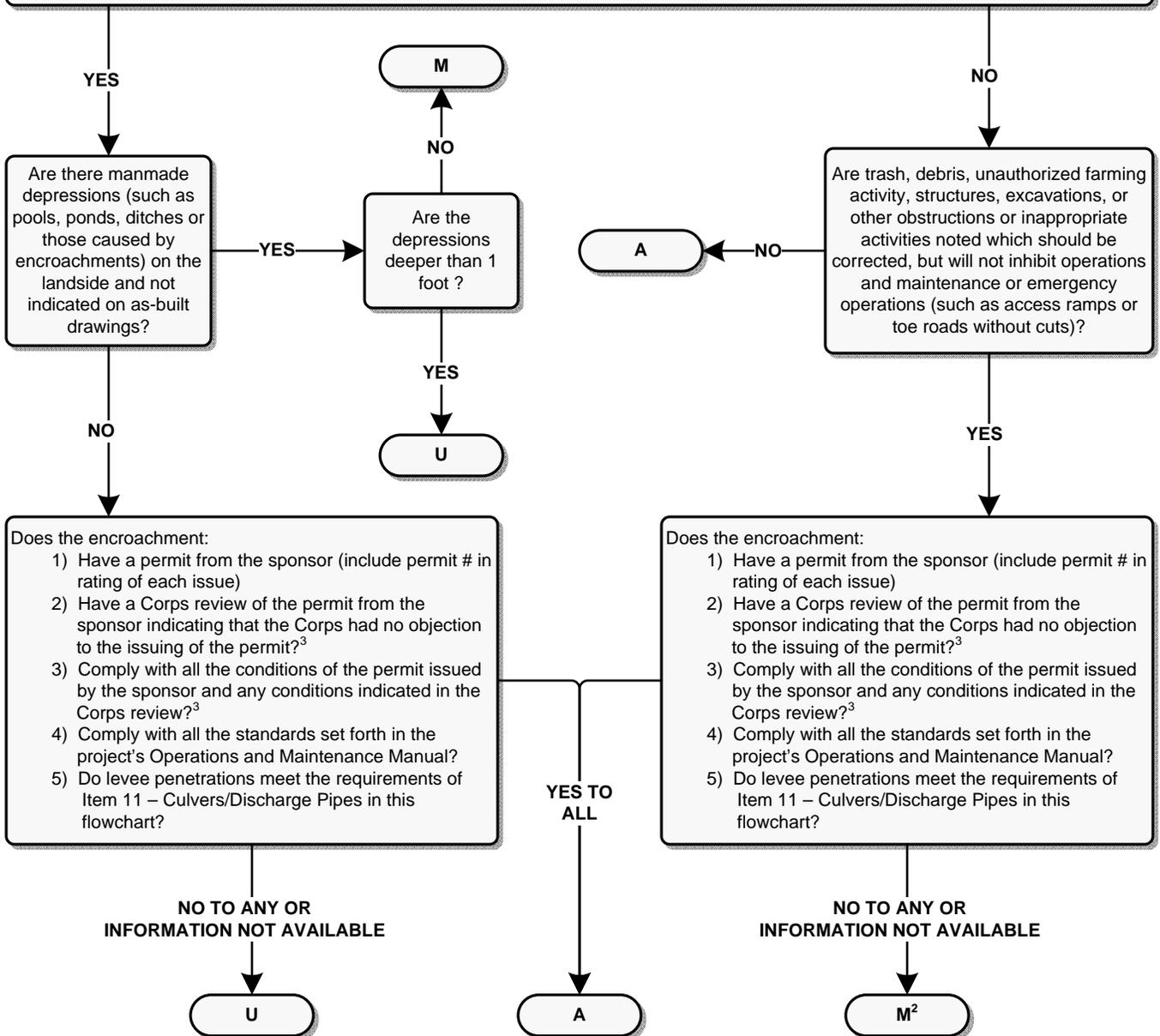
Revised 22 October 2012

Is there an updated levee log which addresses whether each encroachment complies with conditions 1–5 listed below?
 If not, speak to the sponsor about providing this prior to the next inspection. (Inform them that all encroachments will be rated as if they do not have permits unless the permit is made available by the sponsor or the inspector happens to have the permit on hand. It is the sponsor's responsibility to maintain an updated levee log and show proof of permits during the inspection if requested.)

CONTINUE TO DETERMINE RATING

Are there any encroachments on the levee slopes or in the easement area which are likely to inhibit operations and maintenance, emergency operations, or negatively impact the levee integrity?

These may include, but are not limited to:
 power poles, solid board fences, barbed wire fences, any fence or gate that crosses the levee, excavation into the levee prism, irrigation lines, landside toe roads, trash that has been on the levee more than a year and is likely to provide habitat for rodents, decomposing pipes, pipes without an accessible positive closure device at the waterside hinge, retaining walls, ditches which increase the potential for seepage, and concrete blocks with rebar which pose a safety threat to flood fighters.



(Continued on the following page)

3. ENCROACHMENTS (CONTINUED)

Revised 22 October 2012

¹ If the encroachment in question is a pipe (pipes crossing through the levee or running parallel to the levee toe in the easement area that are not a part of the federal project), determine two ratings using this flow chart and the flow chart for item 11. The issue rating will be the lower of the two ratings. Record this rating under item 3 only.

² If a permit is not available during future inspections, minimally acceptable encroachments risk receiving an unacceptable rating during future inspections.

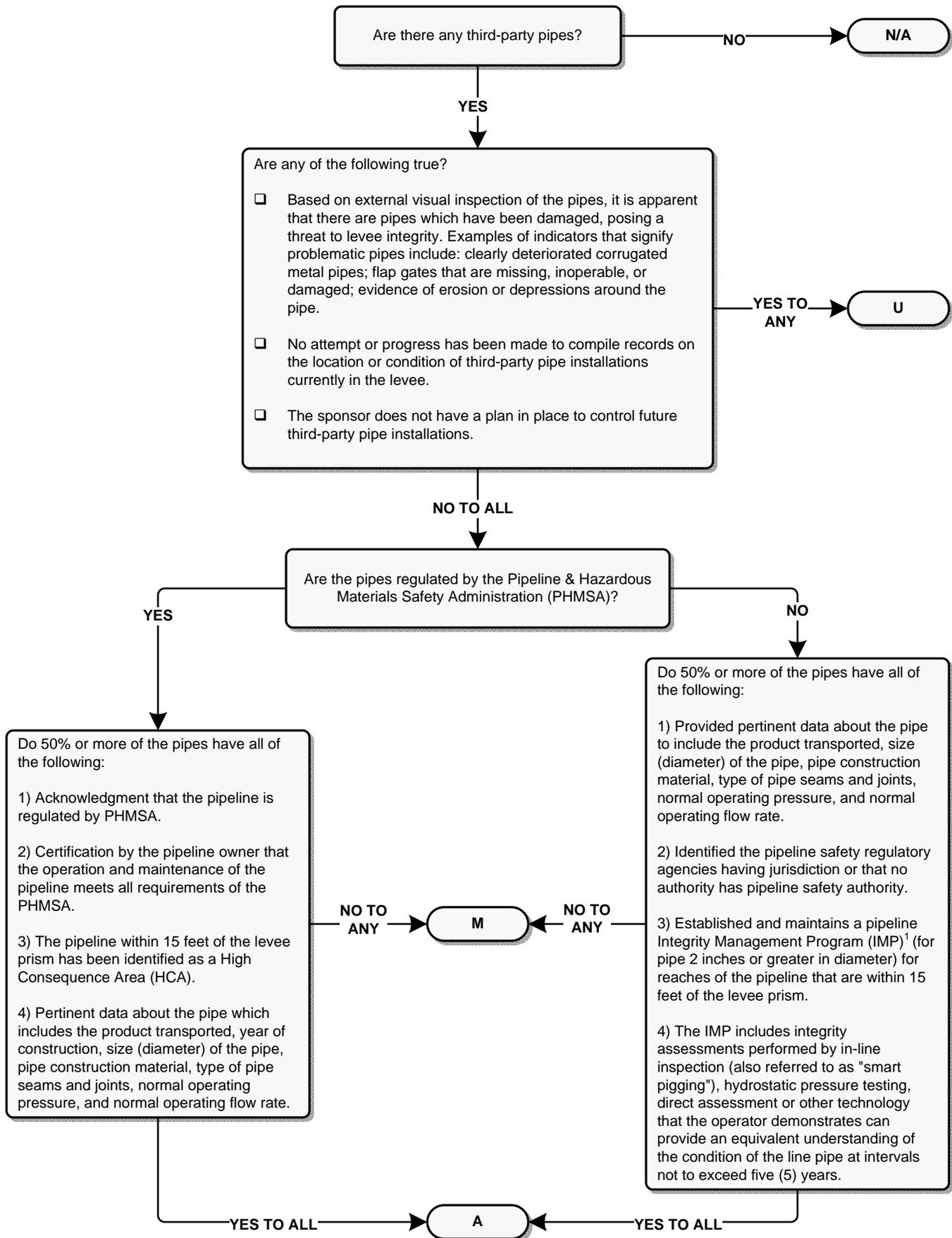
³ If this is a non-Federal levee then proof of compliance with USACE permitting standards at the time the permit was issued by the sponsor is sufficient. Note that USACE does not have authorization to fund USACE personnel to review non-Federal permit applications.

Notes:

- Do not rate paving on the levee crown as an encroachment.
- Toe ditches will be rated "M" for seepage if seepage cannot be ascertained due to water in the ditch or "U" if active seepage or evidence of past seepage is observed.
- Encroachments causing issues severe enough to receive a "U" rating under other items (e.g. Depressions/Rutting, Slope Stability, Erosion) should also be rated "U" for those items.

3. ENCROACHMENTS: PIPES

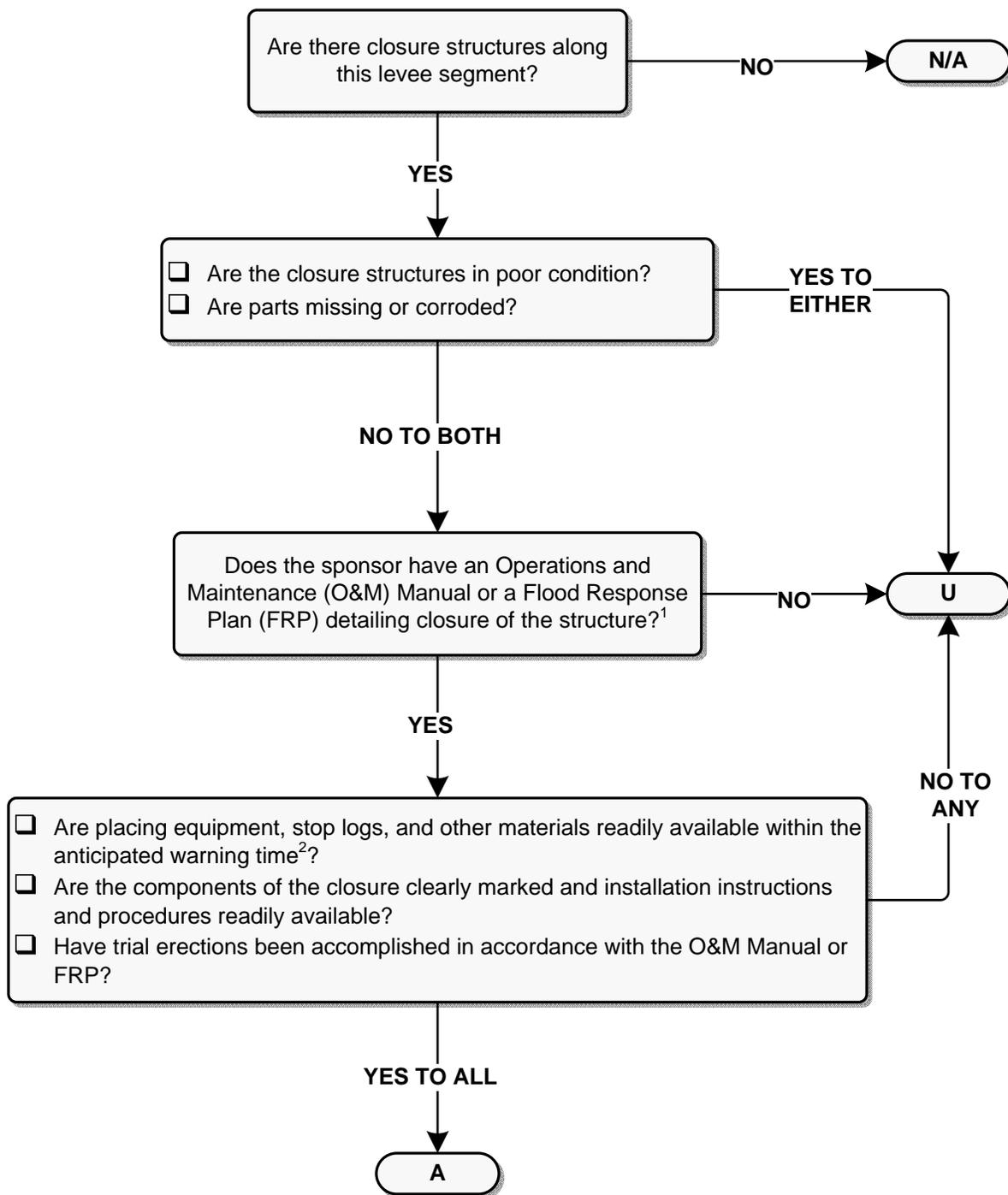
Revised 12 October 2012



¹ Reference the inspection checklist for IMP requirements.

4. CLOSURE STRUCTURES

Revised 5 January 2012

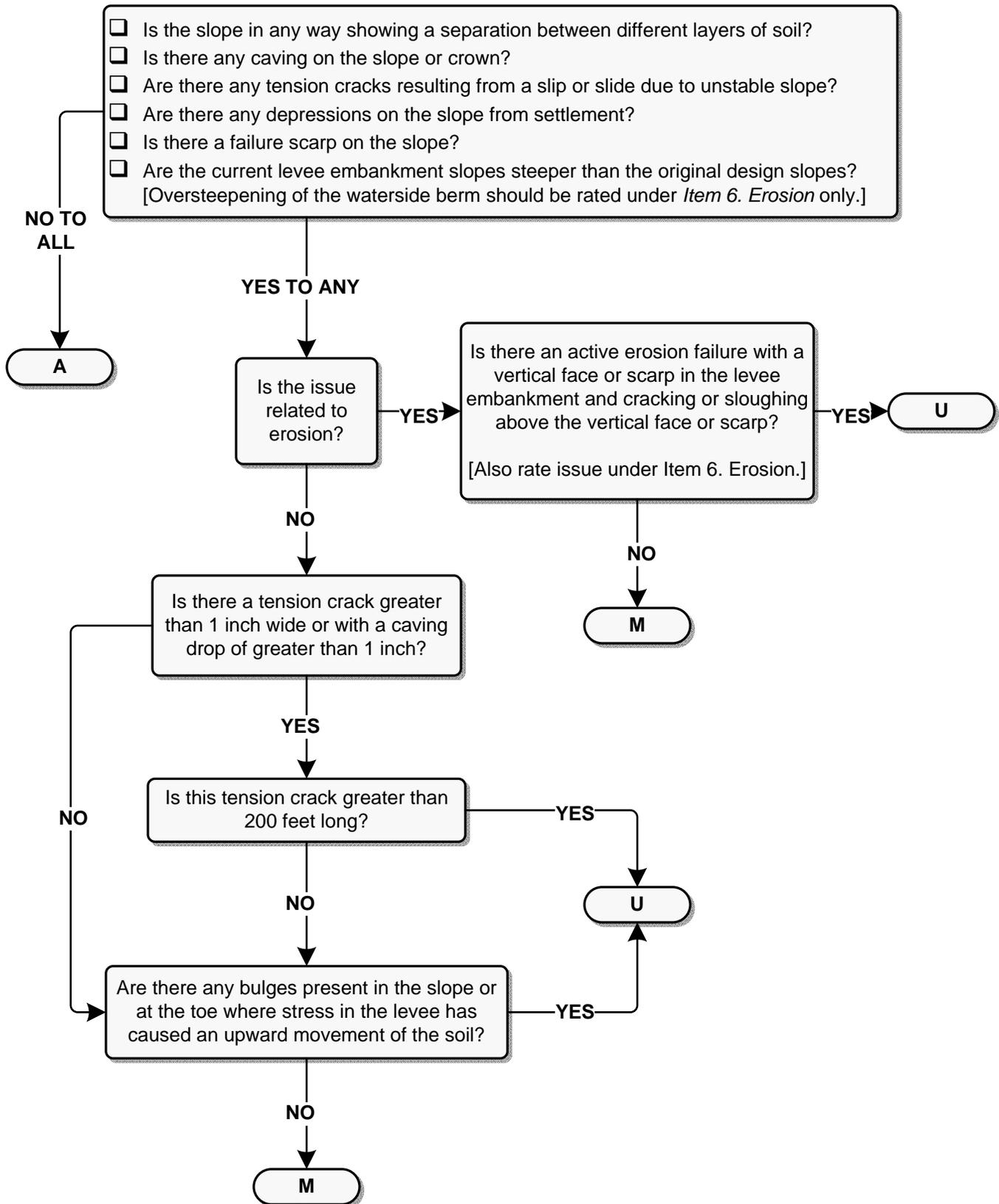


¹ If the sponsor does not have an O&M Manual or a FRP detailing closure of the structure, also assign an M rating in General Items: Item 3 – Flood Preparedness and Training.

² Anticipated warning time and material acquisition can be found in either the O&M Manual or the FRP.

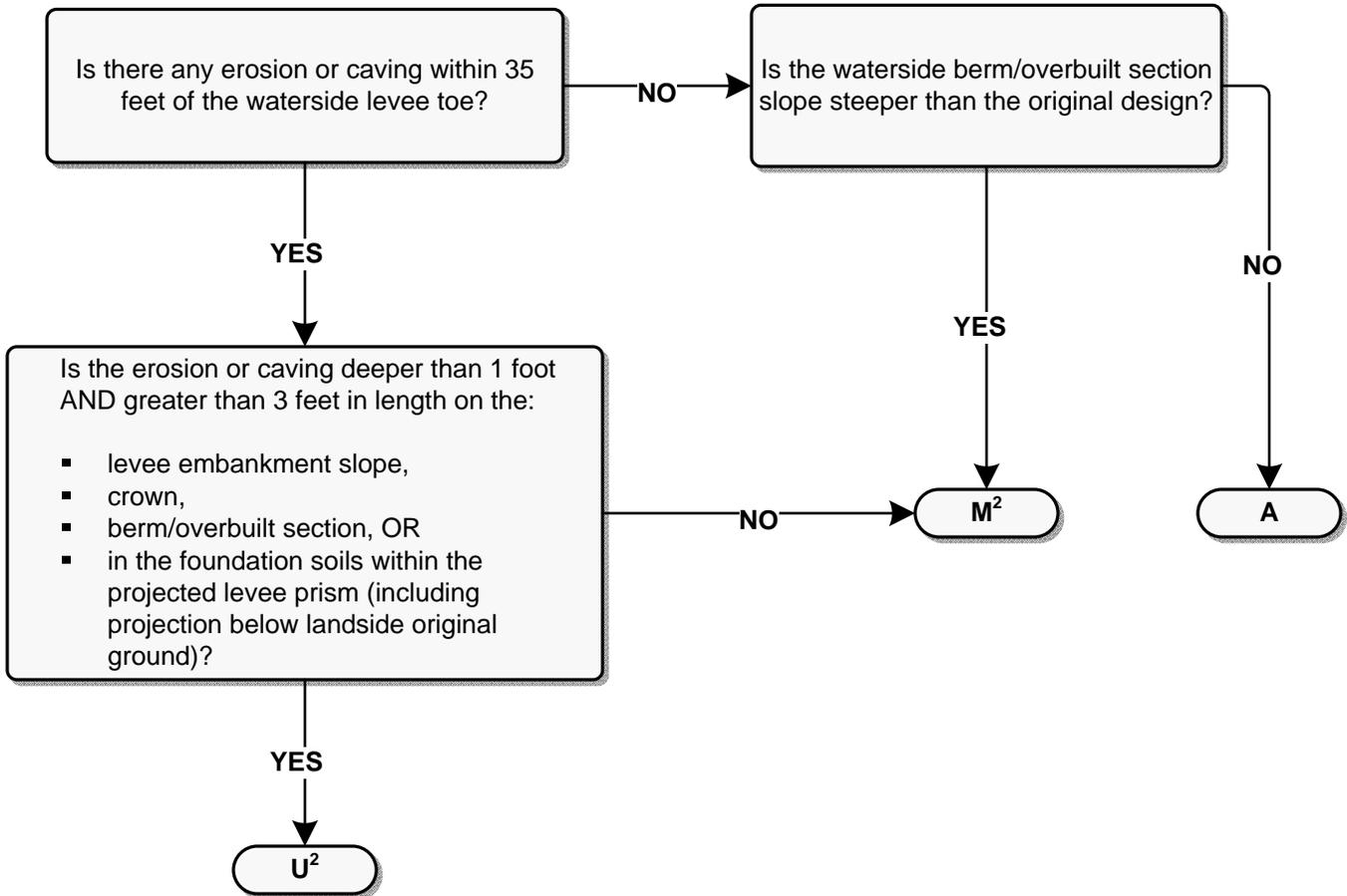
5. SLOPE STABILITY

Revised 22 October 2012

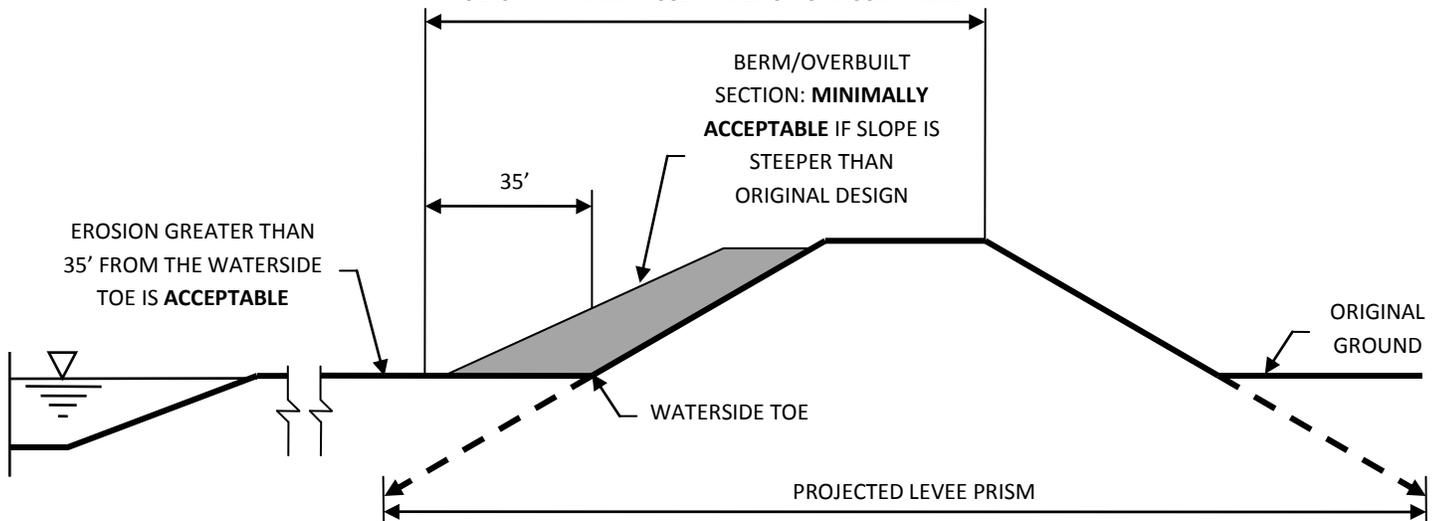


6. EROSION/BANK CAVING¹

Revised 23 October 2012



EROSION ON THE SLOPE, CROWN, BERM/OVERBUILT SECTION, OR PROJECTED LEVEE PRISM WITHIN 35' FROM THE WATERSIDE TOE IS **MINIMALLY ACCEPTABLE** OR **UNACCEPTABLE**

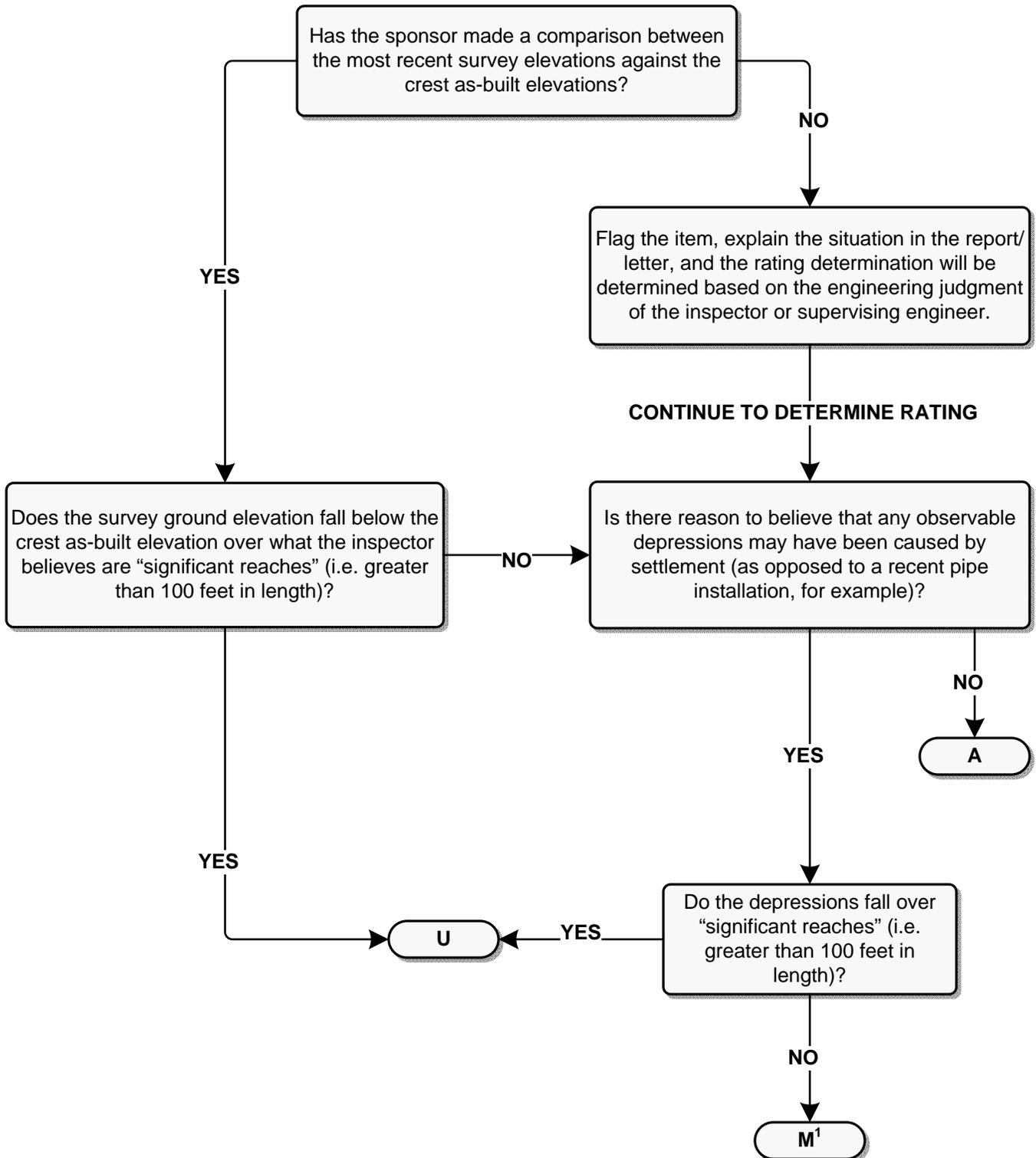


¹ Erosion due to surface runoff is recorded under *Item 2. Sod Cover*.

² Oversteepening of the waterside berm is rated under this item (*Erosion*) alone. Oversteepening of the embankment slopes is also rated M under *Item 5. Slope Stability*.

7. SETTLEMENT

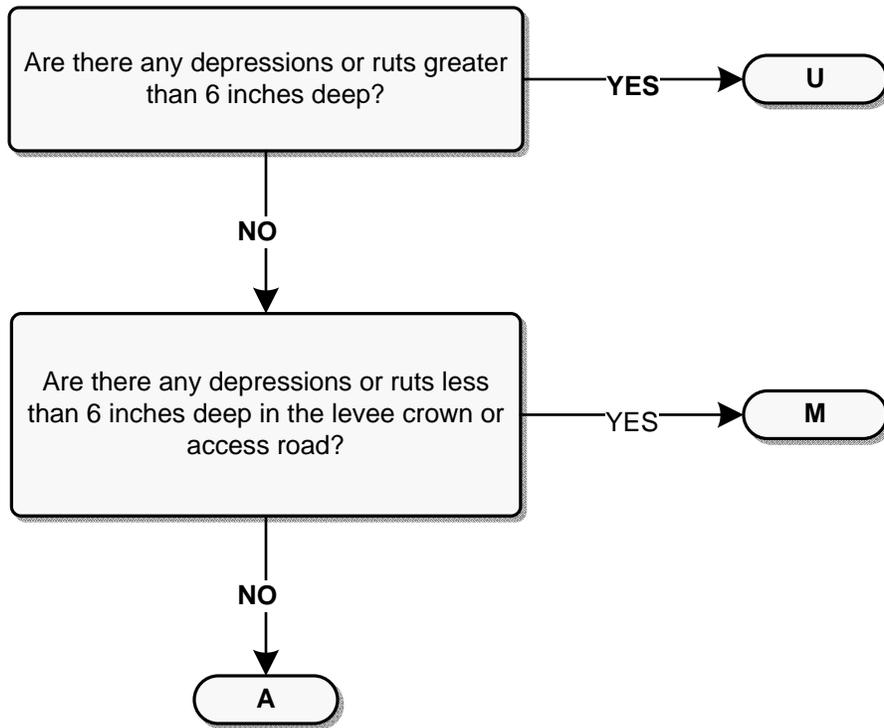
Revised 17 September 2012



¹ Depressions less than 100 feet in length should be rated under *Item 8. Depressions/Rutting*

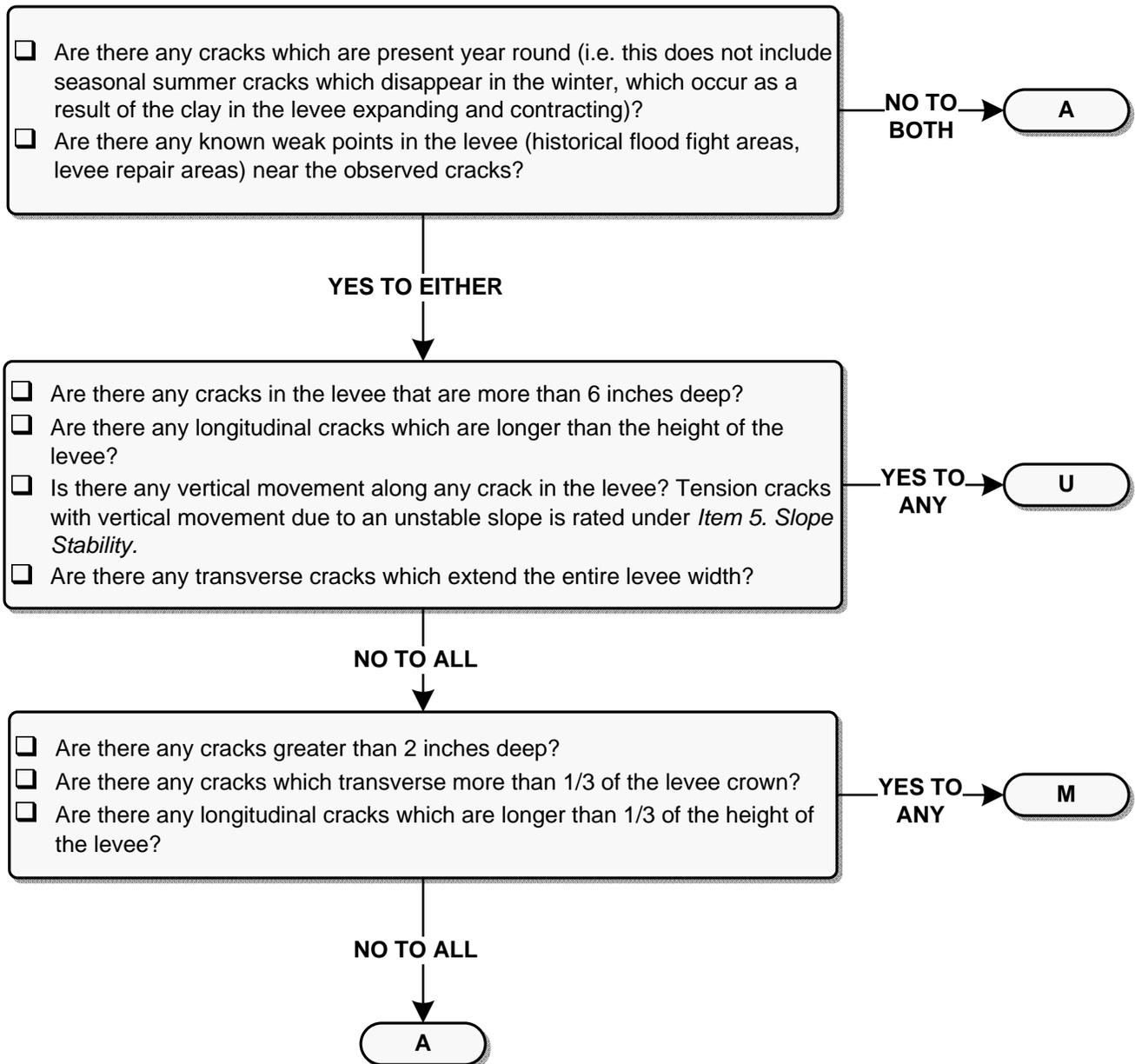
8. DEPRESSION/RUTTING

Revised 5 January 2012



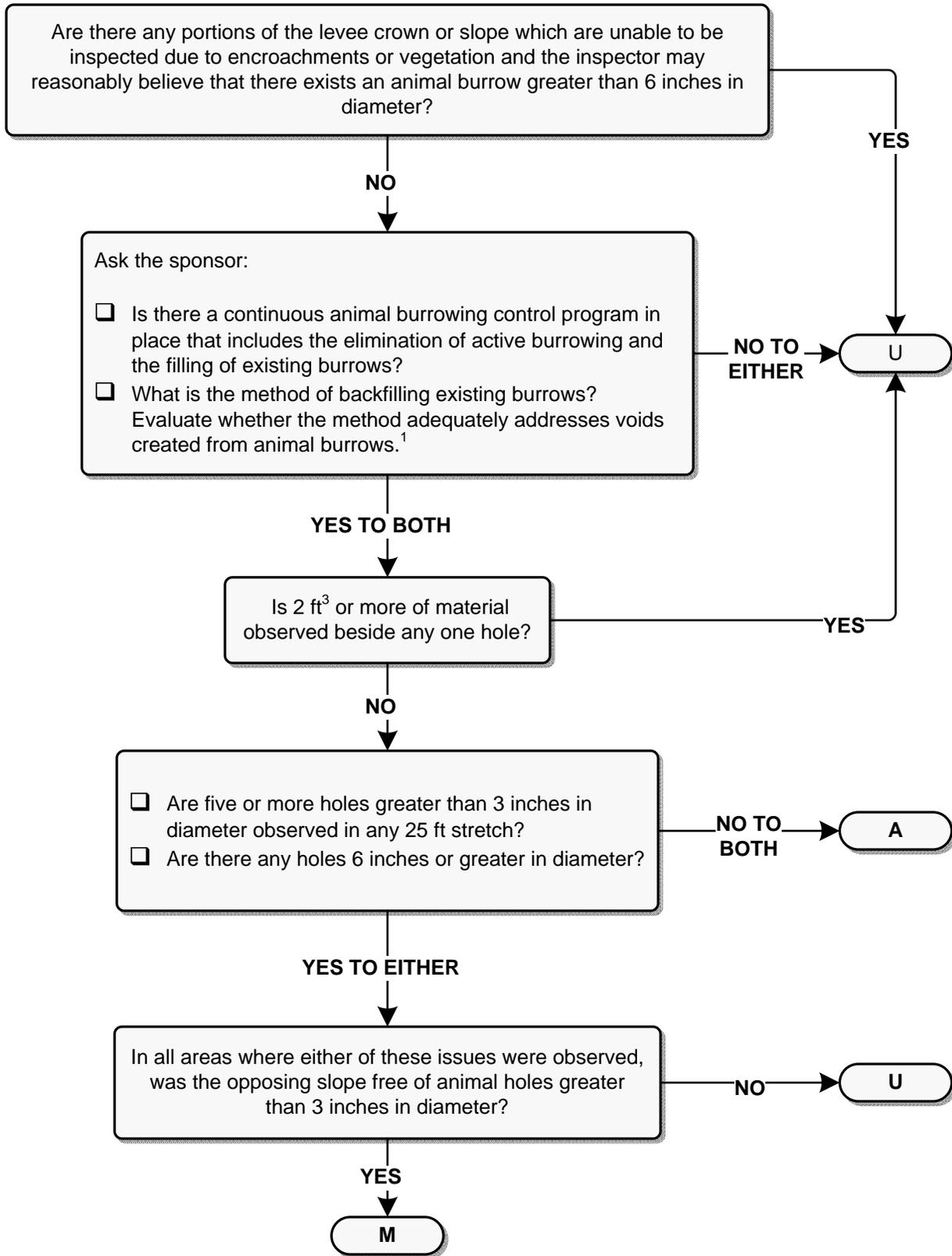
9. CRACKING

Revised 17 September 2012



10. ANIMAL CONTROL

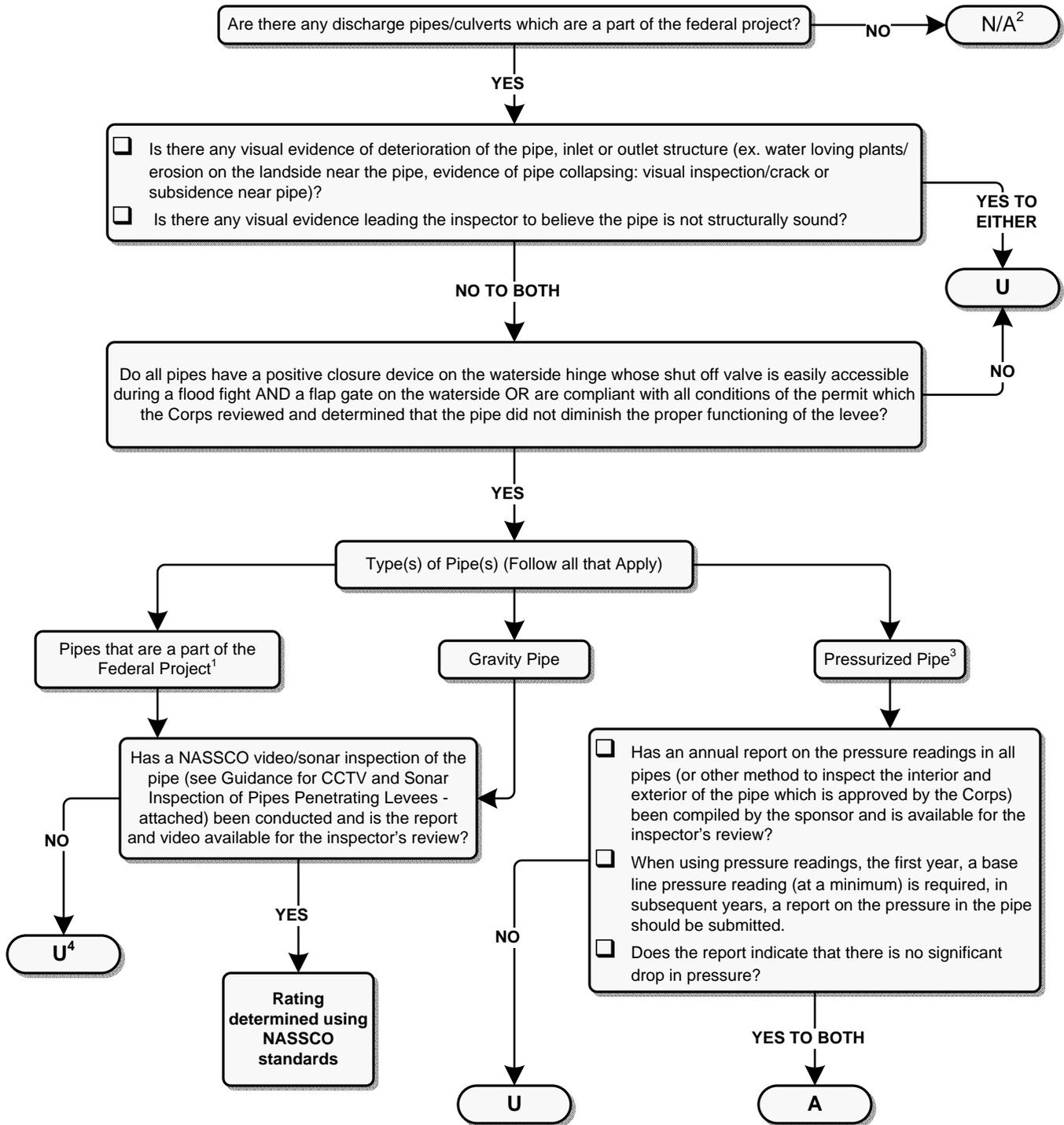
Revised 14 August 2012



¹ During past inspections, we have observed that the following methods have been effective: 1) digging and backfilling (4-6 inch lifts with 98% compaction), 2) grouting (however, there are concerns regarding the interface between the grout and soil and its effectiveness). Experience has also shown that the following methods caused instability issues: 1) Any technique that involves collapsing the burrows (e.g. Rodenator, road roller), 2) shoveling.

11. CULVERTS/DISCHARGE PIPES

Revised 5 January 2012



¹ This item is used to evaluate any pipe passing through the levee cross section that is part of the Federal flood control project. If the O&M Manual specified that a pipe is attached to a pump station or is to be used for interior drainage, then it is also evaluated in the "Pump Station" or "Interior Drainage" Checklist. Drainage canals would also be covered in the interior drainage checklist.

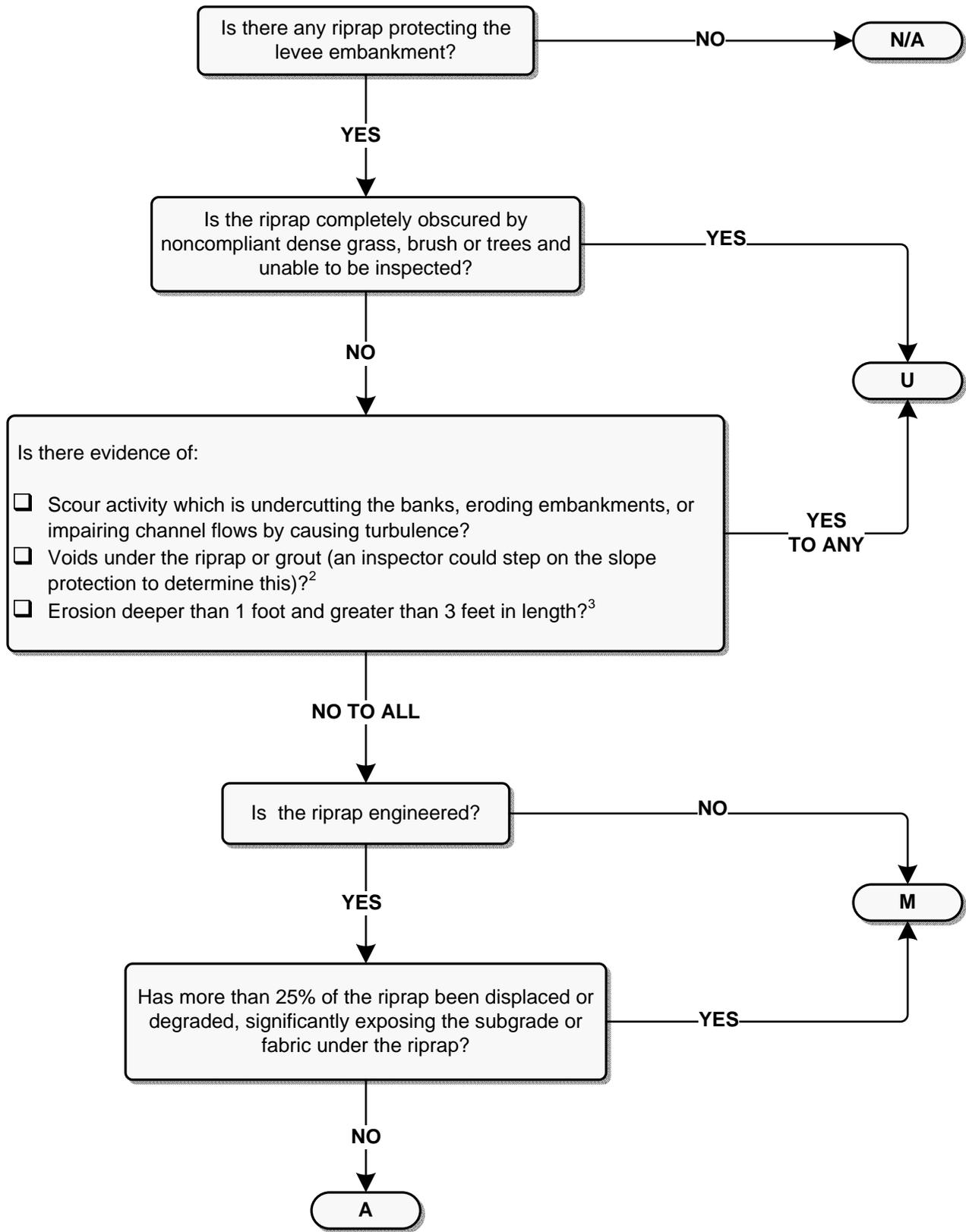
² If there are any discharge pipes/culverts that are not part of the federal project, this flow chart should be followed, in addition to the flow chart in item 3. "Encroachments" and the issue will receive the lower of the two ratings, but the rating should be entered under item 3. "Encroachments".

³ Pressurized pipes – all pipes subject to pressure (continuous or intermittent) this includes irrigation pipes, gas lines and water lines.

⁴ Not having a video inspection, or the intent therein met (e.g. sonar inspection, pressure report), will lead to an unacceptable *item* rating. However, if this is the only issue (not having the video inspection) which could lead to an overall unacceptable *segment* rating it is SPK Policy that this alone does not imply an unacceptable *segment* rating. However, if a video inspection is not submitted within an acceptable period of time, not to exceed two years, an unacceptable *segment* rating will result.

12. RIPRAP REVETMENTS & BANK PROTECTION (ARMORING USING STONE)¹

Revised 21 August 2012



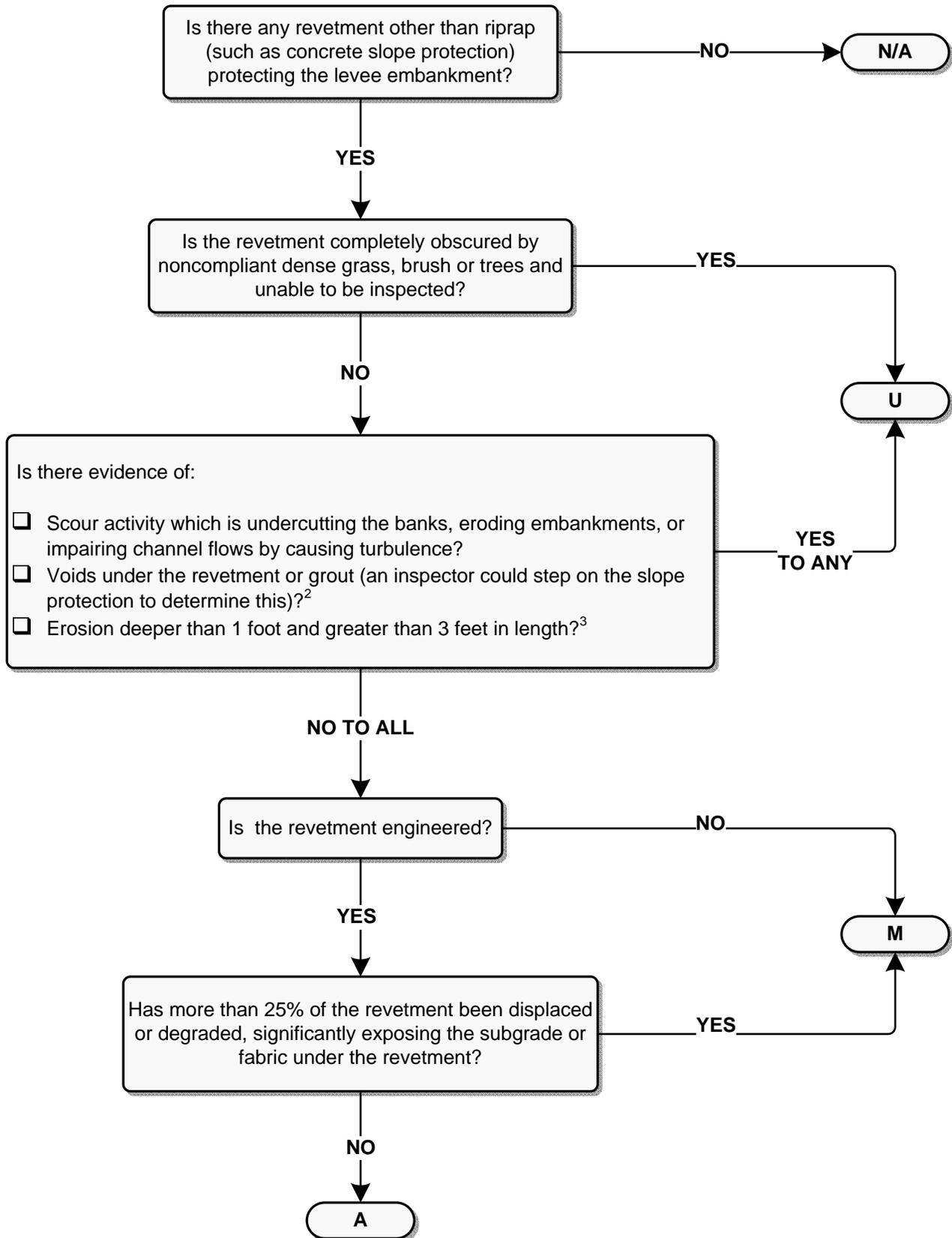
¹ Includes grouted riprap

² If there is any grout cracking or voids in grouted riprap, recommend that the sponsor repair the crack or void.

³ If there is erosion deeper than 1 foot and greater than 3 feet in length, also rate as U under *Item 6. Erosion*

13. REVETMENTS OTHER THAN RIPRAP¹

Revised 21 August 2012



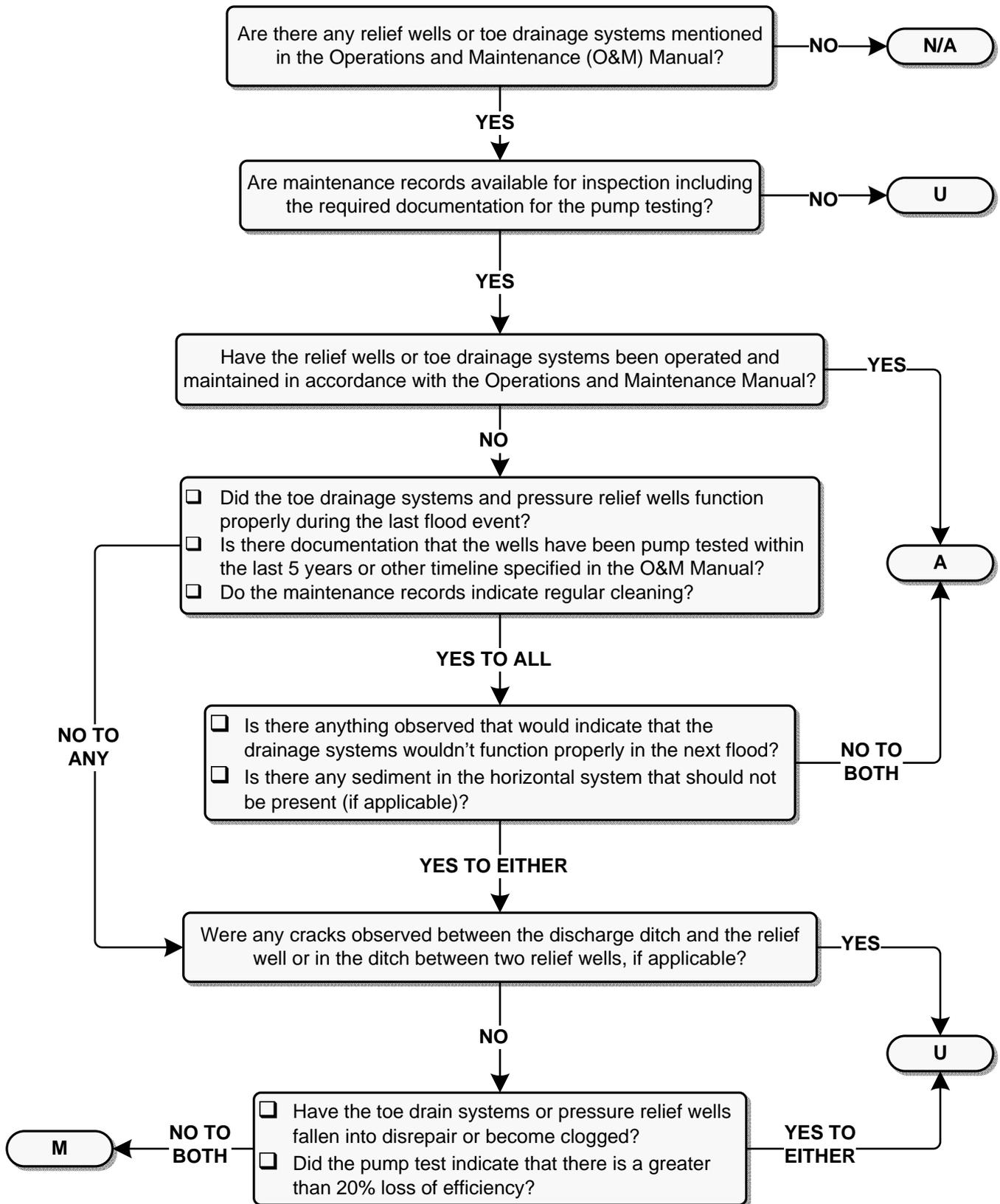
¹ Includes grouted revetment

² If there is any grout cracking or voids in grouted revetment, recommend that the sponsor repair the crack or void.

³ If there is erosion deeper than 1 foot and greater than 3 feet in length, also rate as U under *Item 6. Erosion*

14. UNDERSEEPAGE RELIEF WELLS/TOE DRAINAGE SYSTEM

Revised 4 September 2012



For guidance on pump testing see EM 1110-2-1914, which can be found on the Corps Publications Page (<http://140.194.76.129/publications/index.html>).

15. SEEPAGE

Revised 5 January 2012

