LNAPL Transmissivity: Acceptance and Application in Texas

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Consultant
Government
Responsible Party

Summary

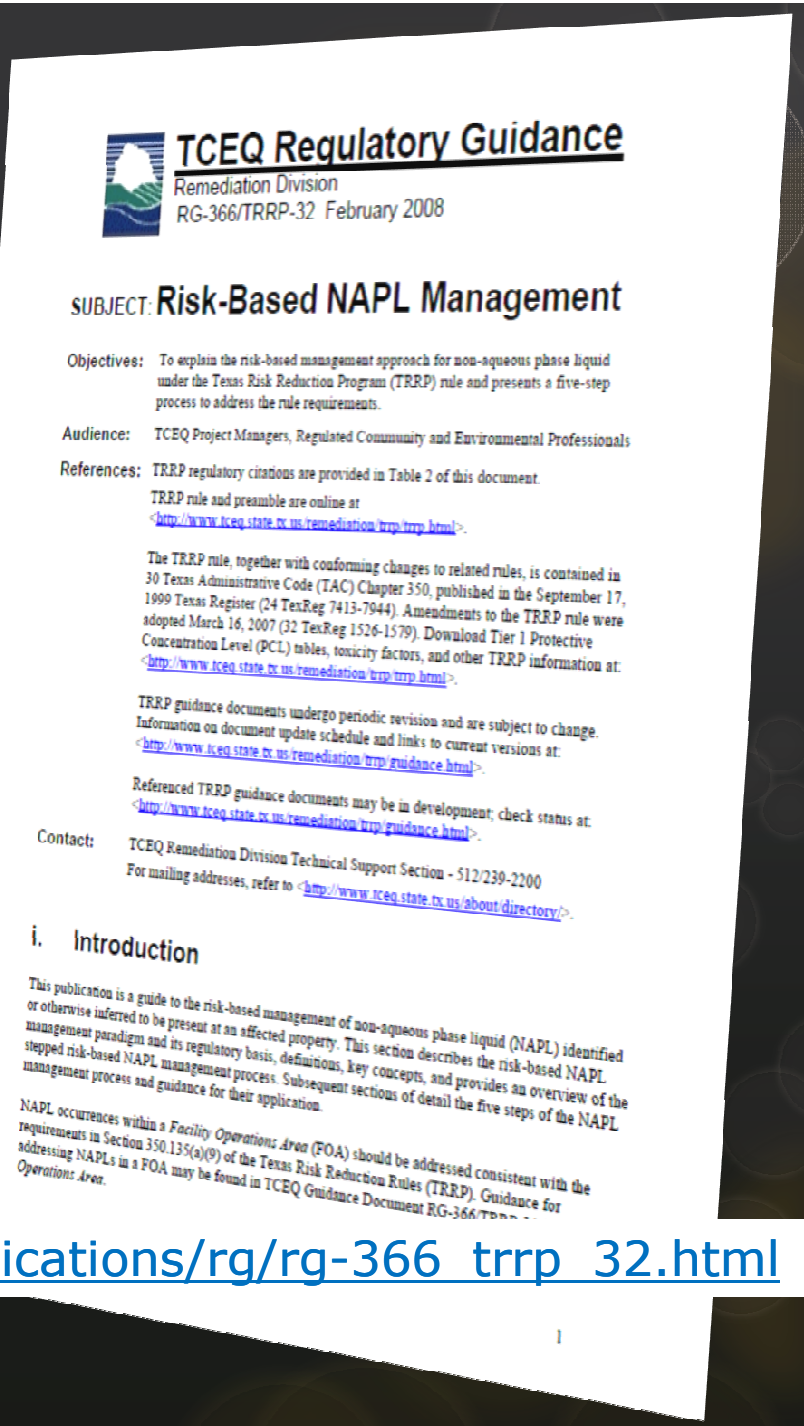
Texas Commission on Environmental Quality (TCEQ)

TX Risk Reduction Program (TRRP)

- TCEQ NAPL Guidance (TRRP-32)
- TCEQ "Readily Recoverable" LNAPL & *Extent Practicable*
- TCEQ Use of Qualitative LNAPL T_n
- TCEQ Acceptance of Quantitative LNAPL T_n

TCEQ TRRP Guidance:

Risk-Based NAPL Management (TRRP-32)



TCEQ Regulatory Guidance
Remediation Division
RG-366/TRRP-32 February 2008

SUBJECT: **Risk-Based NAPL Management**

Objectives: To explain the risk-based management approach for non-aqueous phase liquid under the Texas Risk Reduction Program (TRRP) rule and presents a five-step process to address the rule requirements.

Audience: TCEQ Project Managers, Regulated Community and Environmental Professionals

References: TRRP regulatory citations are provided in Table 2 of this document.

TRRP rule and preamble are online at <http://www.tceq.state.tx.us/remediation/trrp/trrp.html>.

The TRRP rule, together with conforming changes to related rules, is contained in 30 Texas Administrative Code (TAC) Chapter 350, published in the September 17, 1999 Texas Register (24 TexReg 7413-7944). Amendments to the TRRP rule were adopted March 16, 2007 (32 TexReg 1526-1579). Download Tier 1 Protective Concentration Level (PCL) tables, toxicity factors, and other TRRP information at: <http://www.tceq.state.tx.us/remediation/trrp/trrp.html>.

TRRP guidance documents undergo periodic revision and are subject to change. Information on document update schedule and links to current versions at: <http://www.tceq.state.tx.us/remediation/trrp/guidance.html>.

Referenced TRRP guidance documents may be in development; check status at: <http://www.tceq.state.tx.us/remediation/trrp/guidance.html>.

Contact: TCEQ Remediation Division Technical Support Section - 512/239-2200
For mailing addresses, refer to <http://www.tceq.state.tx.us/about/directory/>.

i. Introduction

This publication is a guide to the risk-based management of non-aqueous phase liquid (NAPL) identified or otherwise inferred to be present at an affected property. This section describes the risk-based NAPL management paradigm and its regulatory basis, definitions, key concepts, and provides an overview of the stepped risk-based NAPL management process. Subsequent sections of detail the five steps of the NAPL management process and guidance for their application.

NAPL occurrences within a *Facility Operations Area* (FOA) should be addressed consistent with the requirements in Section 350.135(a)(9) of the Texas Risk Reduction Rules (TRRP). Guidance for addressing NAPLs in a FOA may be found in TCEQ Guidance Document RG-366/TRRP-*Operations Area*.

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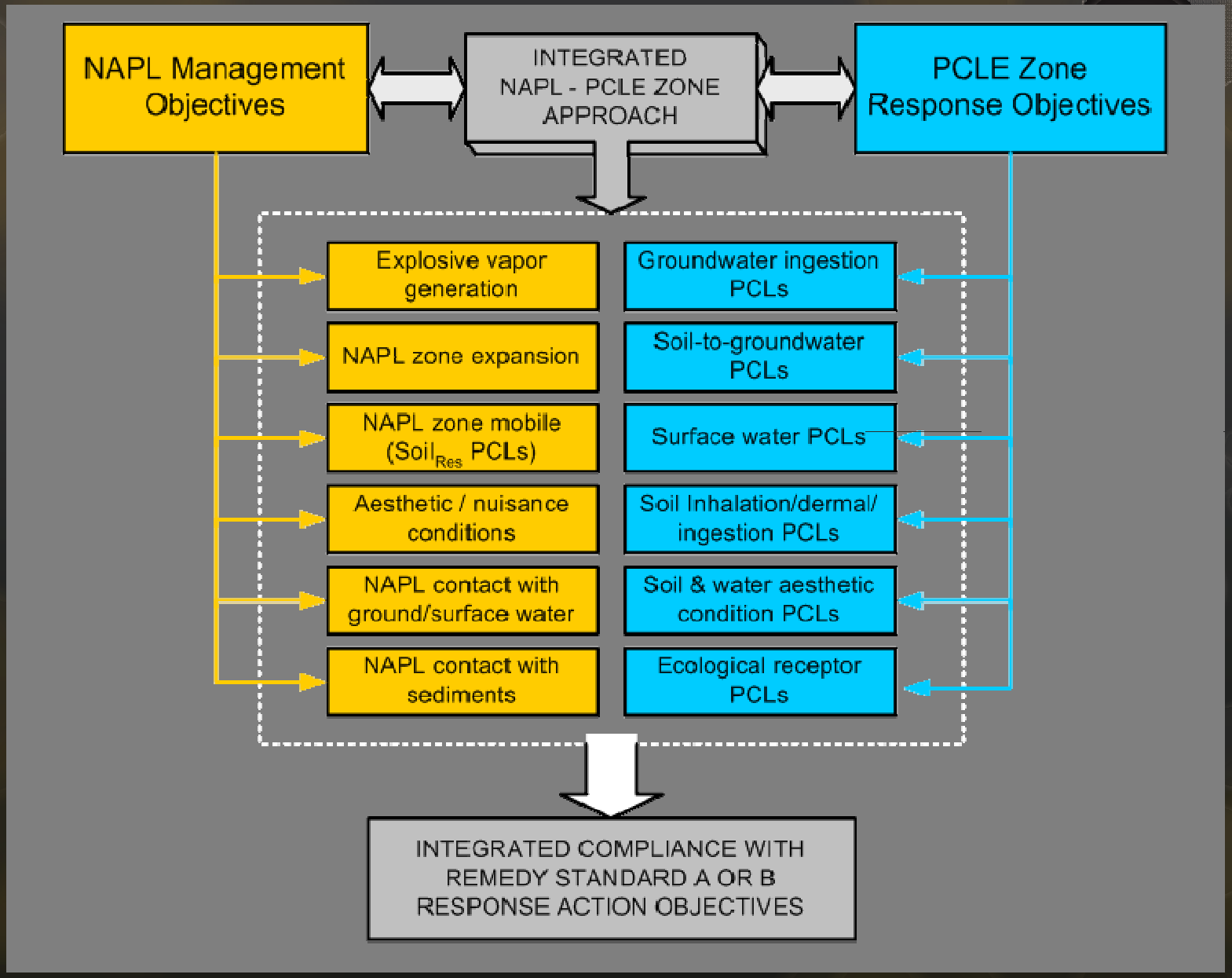
http://www.tceq.texas.gov/publications/rg/rg-366_trrp_32.html

H2A

TCEQ TRRP: NAPL Triggers vs PCL Exceedance



TCEQ TRRP NAPL Triggers

- NAPL Generating Vapors
- Migrating NAPL Zone
- Mobile NAPL Zone
- NAPL Aesthetic Impact or Nuisance Cond.
- NAPL Contact with Groundwater
- NAPL Contact with Surface Water
- NAPL Contact with Sediments

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NAPL Trigger: NAPL Contact w/ Groundwater

Table 18. NAPL Response Objectives and Endpoints for *NAPL Contact with Groundwater Trigger

Site Condition (*from* STEP 2)	NAPL Response Objective	NAPL Response Endpoint	
		Recovery Endpoint	Control Endpoint
❑ NAPL contact w/ Class 1 groundwater ❑ NAPL contact w/ Class 2 / Class 3 groundwater not in PMZ	**Groundwater restoration** **(Sec 3.6.1)**	**RECOVERY ONLY** ❑ Recover soluble NAPL fraction sufficient to eliminate source contributions to GW PCLE zone **(Sec 3.6.1.1)**	**CONTROL (via TI)** ❑ Control soluble NAPL fraction sufficient to create stable (or shrinking) PCLE zone **(Sec 3.6.1.2)**
❑ NAPL contact w/ Class 2 / Class 3 groundwater in PMZ	**Compliance with PMZ performance criteria at NAPL zone** **(Sec 3.6.2)**	**RECOVERY** ❑ Recover readily recoverable NAPL fraction **(Sec 3.6.2.1)**	**(only address recovery endpoint, if applicable)** **(Sec 3.6.2.2)**

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**TRRP-32*

"Readily Recoverable NAPL"

"… the NAPL fraction whose removal can be accomplished by an appropriately designed and properly maintained recovery system based on a conventional technology …" *

conventional technology = hydraulic / pneumatic

*TRRP-32

"Readily Recoverable NAPL"

Readily Recoverable NAPL = Extent Practicable

TRRP-32: Readily Recoverable NAPL: TOOL A

TOOL A

- **Qualitative** determination of recovery potential of conventional technology
- **Transmissivity**

Table A.1. TOOL A (Qualitative Screen for Potential of Conventional NAPL Recovery Technology)

Potential for NAPL Recovery by Conventional Technologies

				SCORE
1. by SOIL TYPE	Clay - Silt	Silt - Sand	Sand - Gravel	
	-1	0	+1	
2. by MAX TRUE NAPL THICKNESS	< 2 in	2 in - 12 in	> 12 in	+
	-1	0	+1	
3. by NAPL VISCOSITY	HIGH (mixed-phase DNAPL PCBs, coal tar)	MEDIUM (heavy refined petroleum (e.g., no. 6 fuel oil)	LOW (light refined petroleum (e.g., gasoline)	+
	-1	0	+1	
4. by NAPL OCCURRENCE	LOW (in saturated zone with double porosity)	MEDIUM (in other saturated zone)	HIGH (in coarse-grained capillary fringe)	+
	-1	0	+1	

Potential for NAPL Recovery by Conventional Technology	TOTAL SCORE
HIGH: recovery likely	+2 to +4
MODERATE: recovery possible	-1 to +1
LOW: consider alternative tech	-4 to -2

⇦ TOTAL SCORE

TRRP-32: Readily Recoverable NAPL: TOOL A

Qualitative Transmissivity Parameters

SOIL TYPE

Residual saturation

Permeability

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+

3. by NAPL VISCOSITY

HIGH (mixed phase DNAPL PCBs, coal tar)	MEDIUM (heavy refined petroleum (e.g., no. 6 fuel oil)	LOW (light refined petroleum (e.g., gasoline)
-1	0	+1

+

4. by NAPL OCCURRENCE

LOW (in saturated zone with double porosity)	MEDIUM (in other saturated zone)	HIGH (in coarse-grained capillary fringe)
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TRRP-32: Readily Recoverable NAPL: TOOL A

Qualitative Transmissivity Parameters

NAPL THICKNESS

LNAPL Saturated thickness

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TRRP-32: Readily Recoverable NAPL: TOOL A

Qualitative Transmissivity Parameters

NAPL VISCOSITY

LNAPL hydraulic conductivity

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TRRP-32: Readily Recoverable NAPL: TOOL A

Qualitative Transmissivity Parameters

NAPL OCCURRENCE

LNAPL effective porosity

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TRRP-32: Readily Recoverable NAPL: TOOL A

Qualitative Transmissivity

NAPL RECOVERABILITY POTENTIAL

LNAPL Transmissivity

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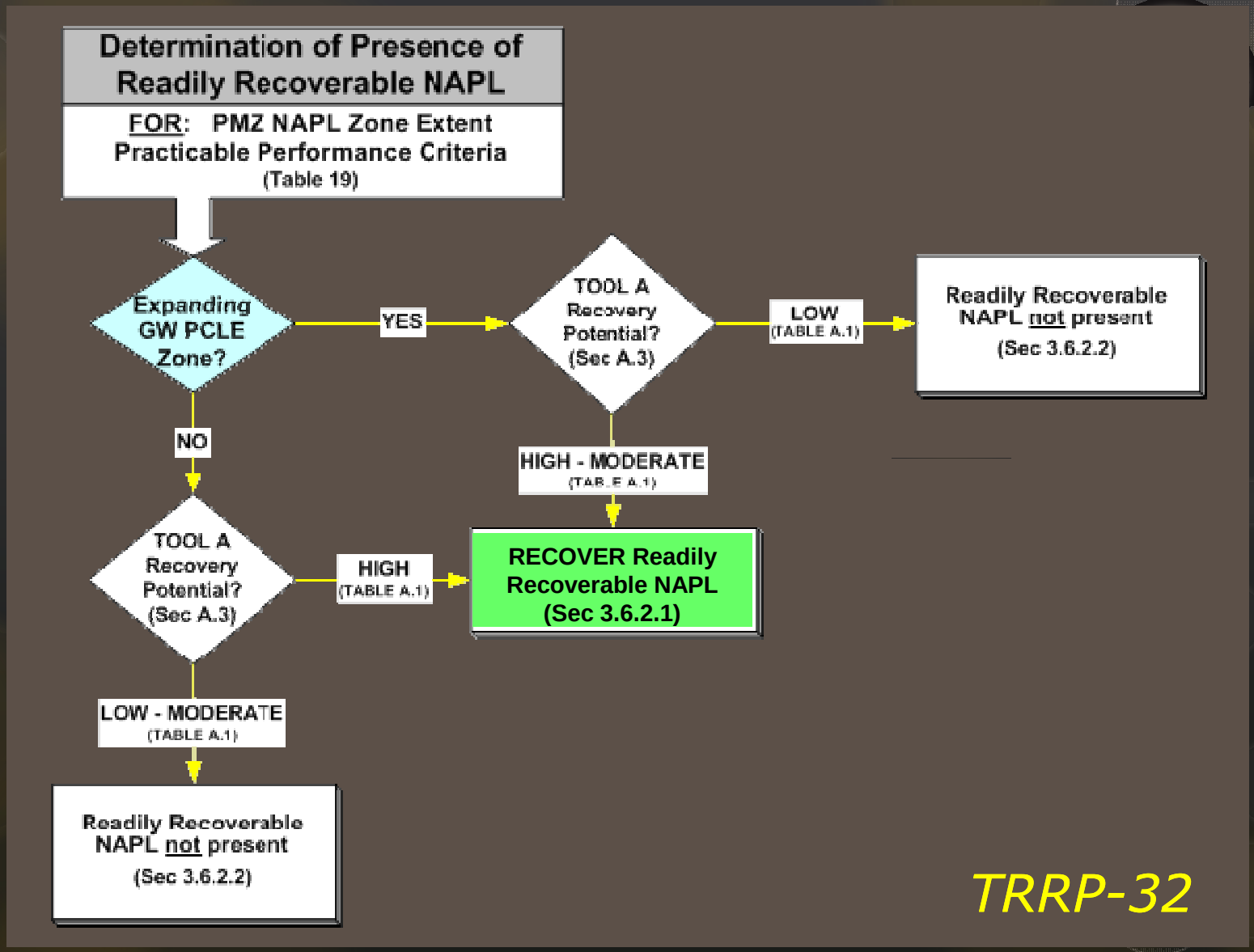
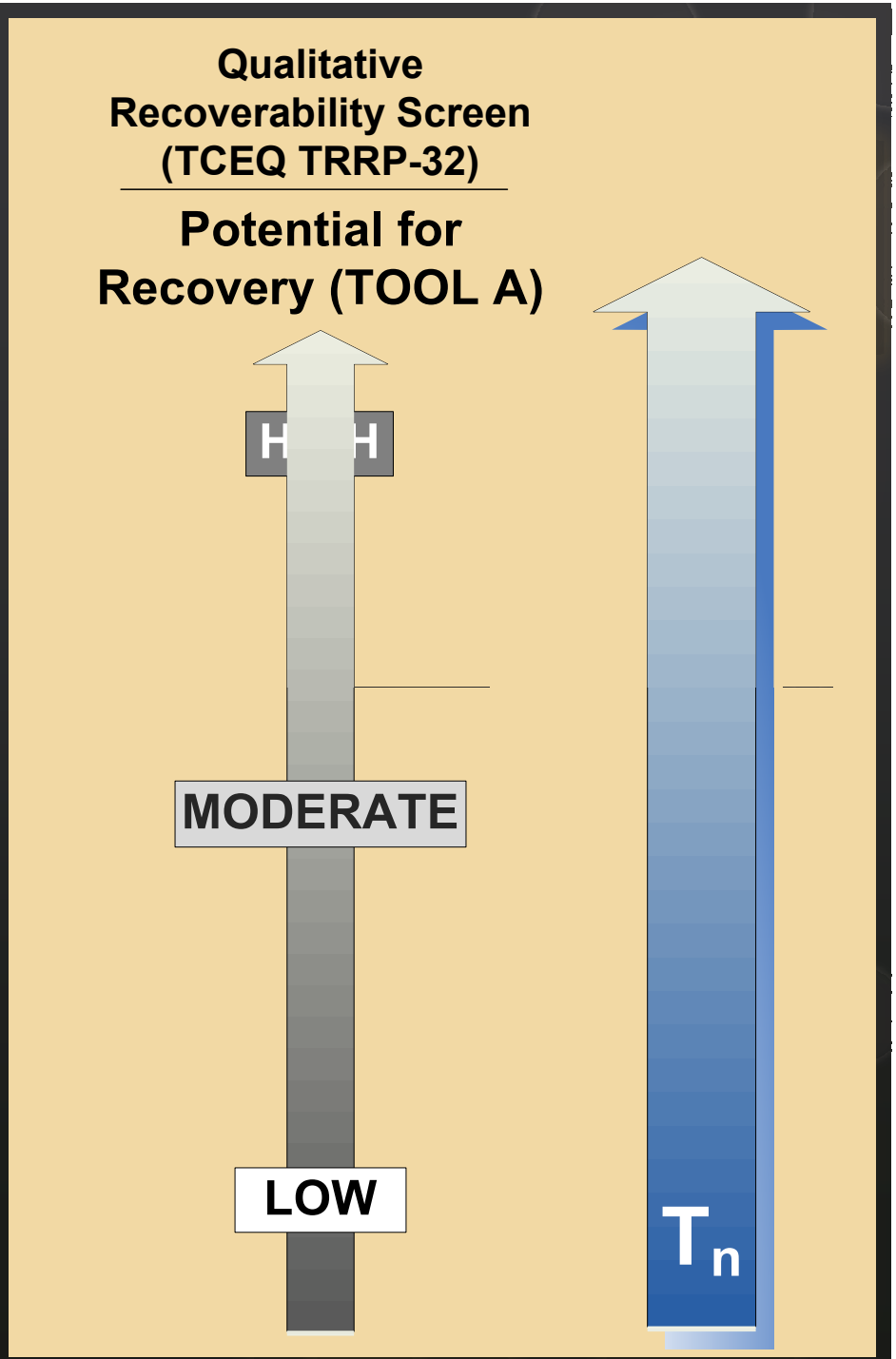
Determination of *Readily Recoverable NAPL*



TRRP-32

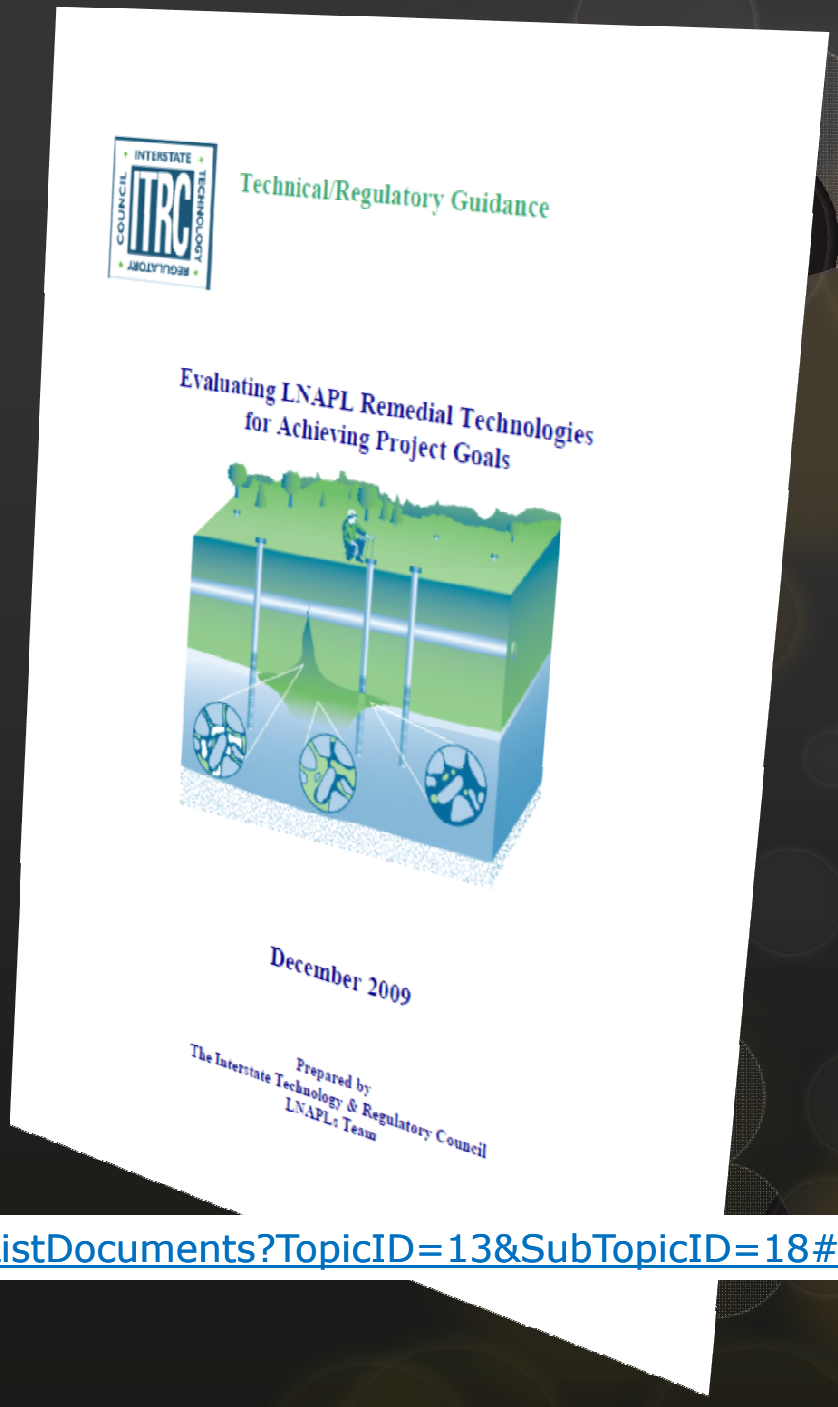
TRRP-32: TOOL A

- Readily Recoverable LNAPL
- Defines *Extent Practicable*
- Qualitative LNAPL Transmissivity



ITRC Technical/Regulatory Guidance:

"Evaluating LNAPL Remedial Technologies for Achieving Project Goals"

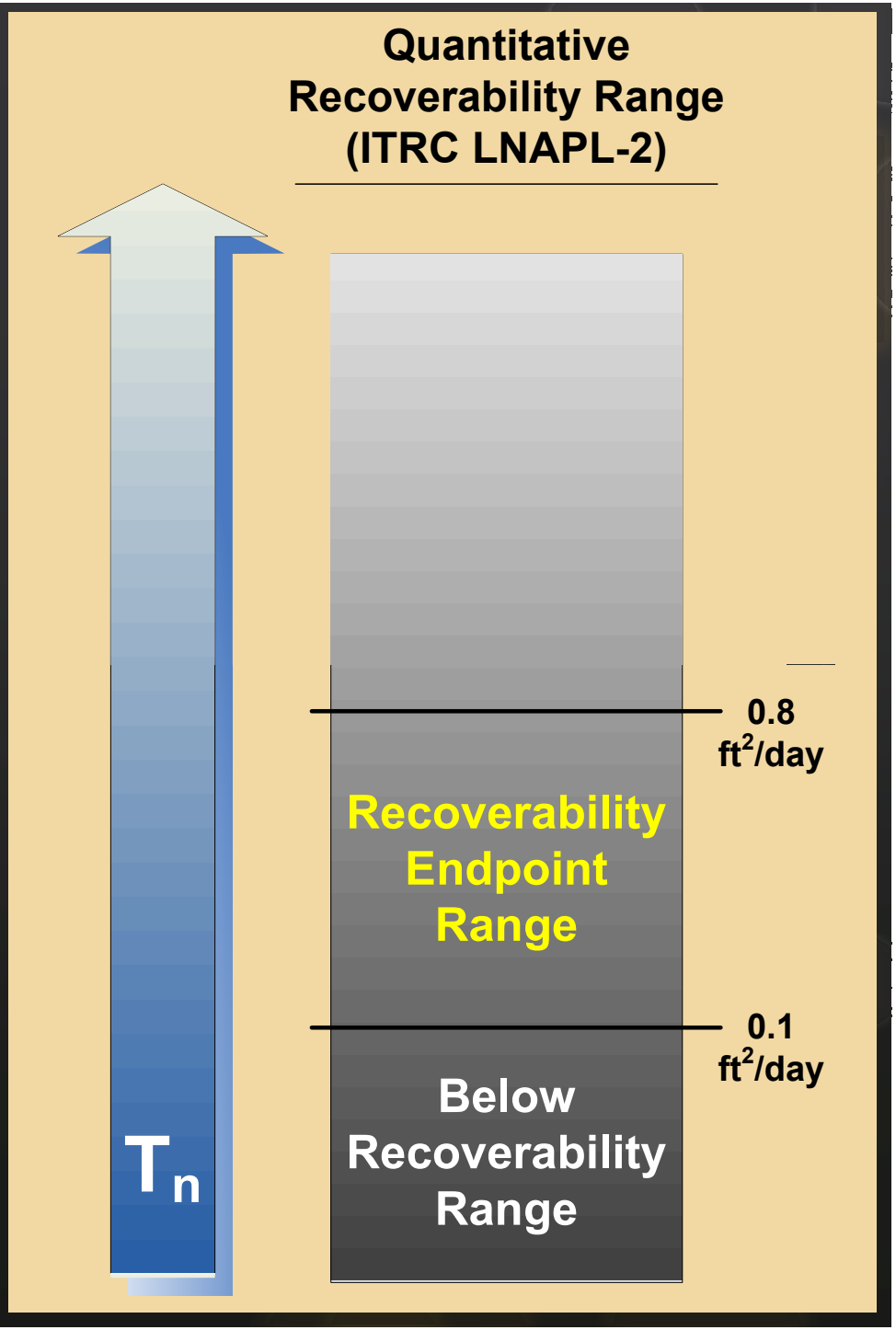


http://www.itrcweb.org/Guidance/ListDocuments?TopicID=13&SubTopicID=18#

ITRC LNAPL Tech/Reg Guidance

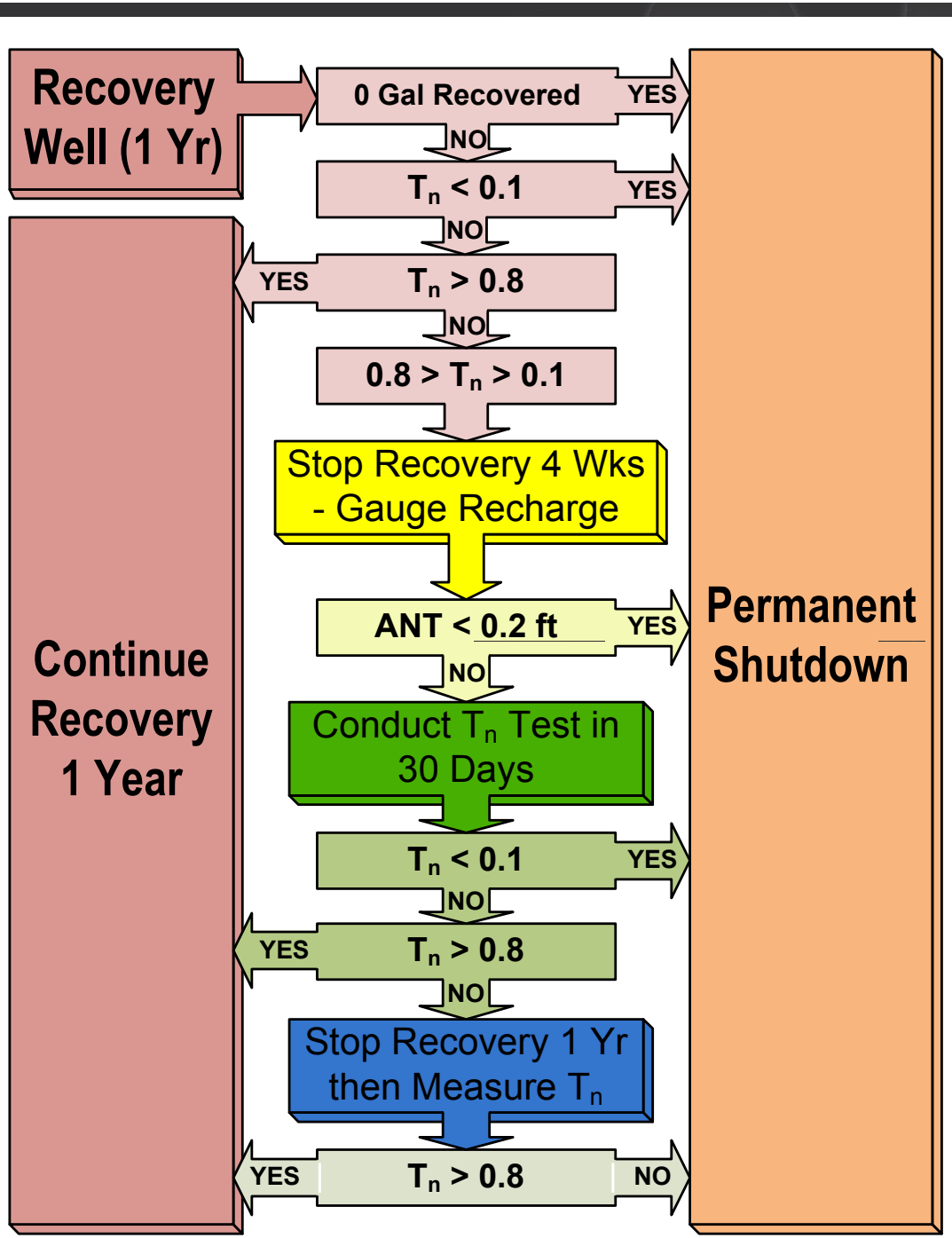
- **QUANTITATIVE** LNAPL Transmissivity as Hydraulic Recovery Performance Metric
- Recoverability Limit:

$0.1\ ft^2/d > T_n > 0.8\ ft^2/d$

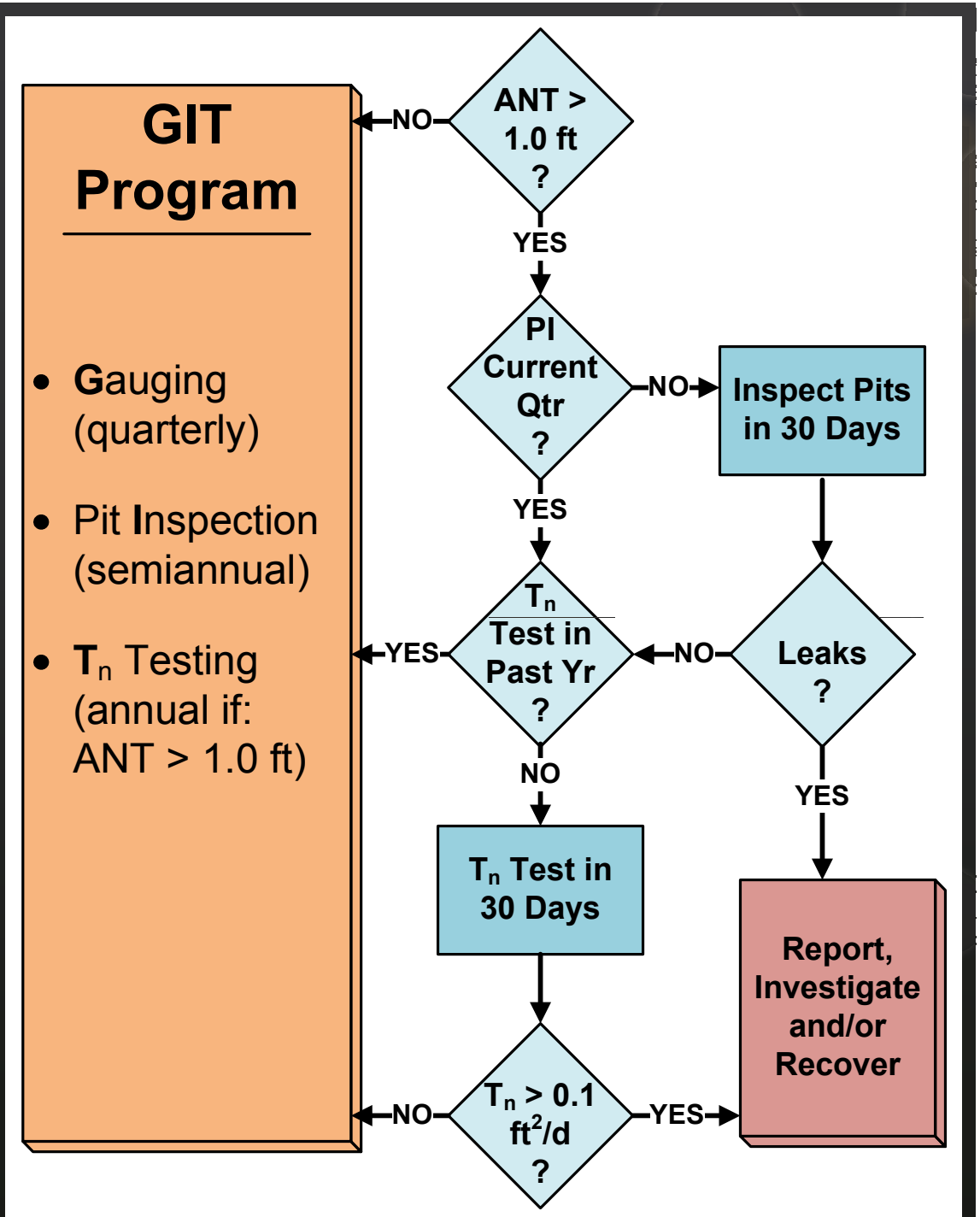


TCEQ–Accepted T_n - Based LNAPL Management Plan for Recovery Well Shutdown (Refinery)

T_n (ft^2/day)

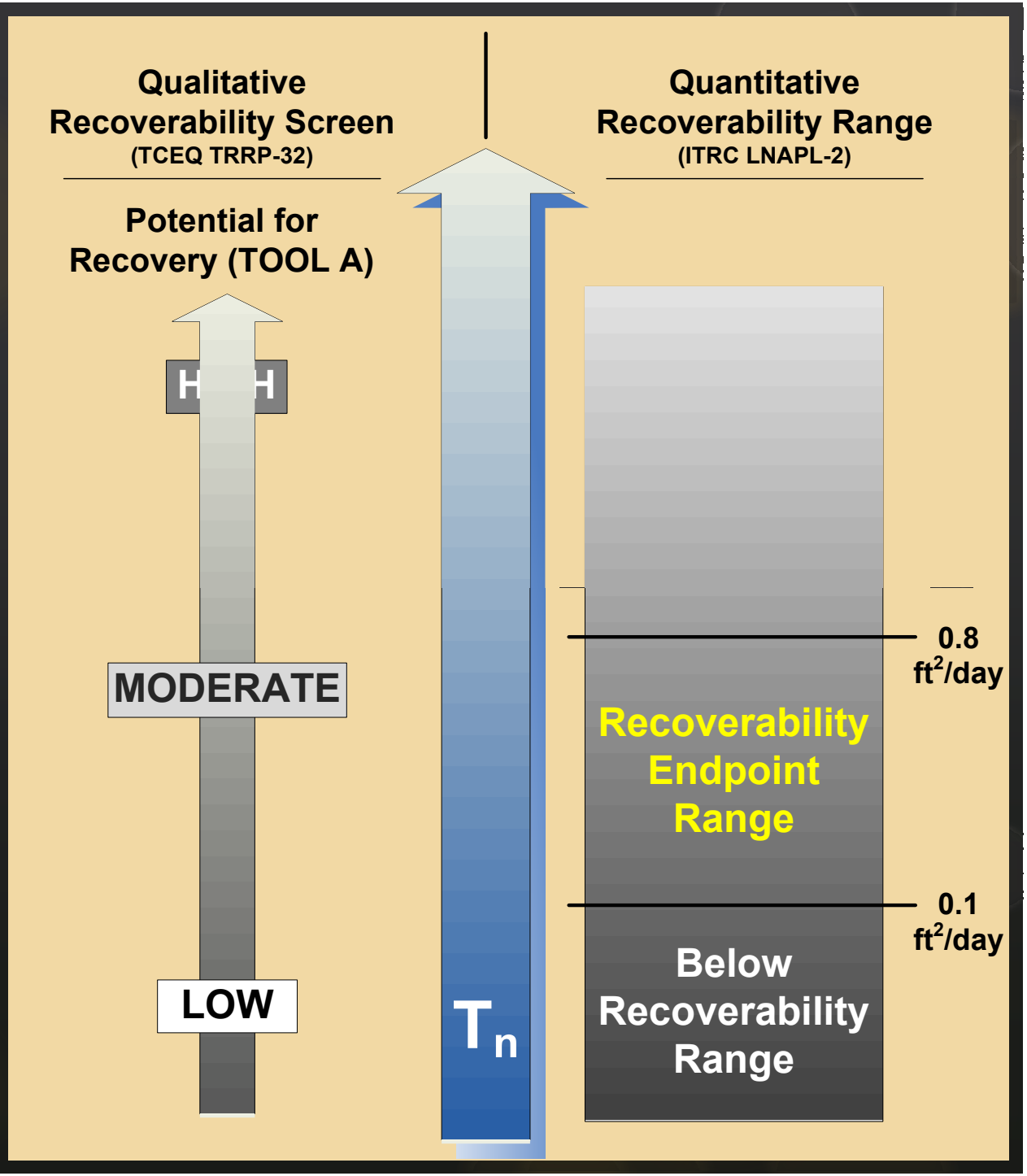


TCEQ–Accepted T_n - Based LNAPL Management Plan for Leak Detection (Airport)



Conclusions

- TCEQ uses qualitative T_n as recoverability screen and to define *Extent Practicable*
- TCEQ accepted quantitative T_n-based recoverability limit in LNAPL Management Plan



Questions?