DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action

Environmental Indicator (EI) RCRIS code (CA725)

Current Human Exposures Under Control

Facility Name: Navajo Refining Company
Facility Address: 501 East Main Street, Artesia, New Mexico 88210
Facility EPA ID #: NMD048918817

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

__X_ If yes - check here and continue with #2 below.

_____ If no - re-evaluate existing data, or

_____ if data are not available, skip to #6 and enter"IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives that are currently being used as Program measures for the Government Performance and Results Act of 1993, (GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	Yes	No	?	Rationale / Key Contaminants
Groundwater	_X_	___	___	VOCs, SVOCs, TPH, lead, chromium, arsenic
Air (indoors)[2]	___	___	_NA	
Surface Soil (e.g., <2 ft	_X_	___	___	BETX, SVOCs, TPH, lead, arsenic
Surface Water	___	___	___	
Sediment	___	___	_NA	
Subsurf. Soil (e.g., >2 ft)	_X_	___	___	VOCs, SVOCs and TPH, lead, arsenic
Air (outdoors)	___	___	_NA	

_____ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

__X__ If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

_____ If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale and Reference(s):

Groundwater contamination as phase-separated hydrocarbons and dissolved-phase BETX and other volatile organic compounds (VOCs), naphthalene and other semivolatile organic compounds (SVOCs), MTBE, gasoline- diesel- and oil-range organics (GRO, DRO and ORO), lead, arsenic and chromium are present beneath the refinery facility and off site to the east of the refinery. Based on information provided in Part B of Navajo Refining Company's Post-closure Care Permit Application (March, 2001), the refinery is conducting ongoing phase-separated hydrocarbon and total fluids recovery as an interim measure to reduce the concentrations and migration of contaminants in groundwater in the shallow water table aquifer. The data suggests that phase-separated hydrocarbon thicknesses present on the water table have generally been significantly reduced since 1995. The lateral extents of the phase-separated hydrocarbon plumes beneath the refinery have not been defined in the vicinities of the process areas and aboveground storage tank (AST) farms. The off site contaminant plumes are currently delineated.

Historically, hydrocarbon contamination has been observed in shallow groundwater in the north and south plant tank farms, the north plant process areas and at five evaporation ponds located adjacent to the Pecos River three miles east of the refinery. (Consolidated RI/CMS Report for Three Mile Ditch and Evaporation Ponds, Navajo Refining Company (1997).

The evaporation ponds were taken out of service in October 1999 in compliance with an Administrative Order on Consent issued in 1998. Navajo Refining Company is in the process of revising a Post-closure Care Permit Application for closure of the Evaporation Ponds and Post-closure Care of three Regulated Units. The Regulated Units consist of the Evaporation Ponds, a land treatment unit [North Colony Landfarm (NCL)] and a former tetra ethyl lead waste landfill and weathering area (TEL). NMED is preparing a Post-closure Care Permit for the facility that will incorporate requirements for corrective action at the regulated units and at SWMUs and AOCs at the facility.

Based on the results of chemical analyses of groundwater samples obtained from irrigation wells located downgradient of the refinery, historical releases from the refinery have not affected groundwater

present in the valley fill aquifer. The depth to the top of the valley-fill aquifer that is used locally for domestic and agricultural water supply is approximately 200-300 feet below the ground surface. The shallow water table aquifer in the vicinity of the refinery is not currently used for either industrial, agricultural or domestic purposes therefore NMED considers human exposures to be controlled with regard to groundwater at the facility. [Navajo Refining Company Post-closure Care Permit Application, Part B (March, 2001]

Petroleum-related surface soil contamination is not documented at the facility with the exception of the evaporation ponds closed in October 1999. The water in the evaporation ponds has subsequently evaporated and the sediments have been allowed to dry. Corrective action will be required at the evaporation ponds by the Post-closure Care Permit currently in preparation by NMED. The evaporation ponds are located in a remote area three miles east of the refinery and are separated by the surrounding rangeland by a six-foot high chain-link fence with a locking gate. Unauthorized personnel are not allowed in the Evaporation Ponds location. The refinery process areas and tank farms are separated from surrounding properties by a chain-link fence topped with barbed wire. Access to the refinery is limited to a gate continuously manned by a security guard and a secured employee entry gate secured with electronic keypad access. Based on the restricted access to the refinery and the Evaporation Ponds and the location of the evaporation ponds in a remote area unlikely to be accessed by personnel other than refinery personnel performing periodic inspections, the possibility of human exposure to surface soil contamination at the refinery or Evaporation Ponds is considered unlikely. In addition, Navajo Refinery has established standard operating procedures (Work Permit System) to regulate construction work and to implement federal and state health and safety regulations regarding refinery operations and accidental releases [Navajo Refining Company Work Permit System (Safe Work /Hazardous Assessment (revised 2000), Hot Work (revised 1997), Confined Space Entry (revised 1997), Excavation Permit (revised 2000) and Emergency Plan (revised 2001))] therefore NMED considers human exposures to be controlled with regard to surface soil contamination at these locations.

Petroleum-related subsurface soil contamination is known to be present beneath the refinery process areas and tank farms. In addition, petroleum-related subsurface soil contamination is known or suspected to be present at the Evaporation Ponds, Three Mile Ditch, a formerly open ditch that conveyed refinery wastewater to the Evaporation Ponds, four API separators, the location of clarified slurry oil storage tanks, and at the regulated units. NMED is currently preparing a Post-closure Care Permit that will require corrective action at all locations where petroleum-related contamination is known or suspected to be present at the refinery. Human exposures are controlled at the refinery by access restrictions, implementation of health and safety procedures and by monitoring work activities throughout the refinery [Navajo Refining Company Work Permit System and Navajo Refining Company Post-closure Care Permit Application, Part B (March, 2001]

REGULATED UNIT SUMMARY

There are three regulated units at Navajo Refining Company's Artesia Refinery. The regulated units are the Evaporation Ponds, North Colony Landfarm (NCL) and Tetra Ethyl Lead Surface Impoundment (TEL) and are described below:

The Evaporation Ponds are located adjacent to the Pecos River approximately three miles east of the refinery. Pond 1 received refinery wastewater between the early 1930s and 1987. Ponds 2, 3, 5, and 6 were constructed between 1966 and 1988. The combined surface area of the evaporation ponds is approximately 111 acres. Refinery wastewater effluent discharged directly from an open ditch (Three Mile Ditch [TMD]) to Pond 1 until 1987. In 1987, discharge to Pond 1 was discontinued and Pond 1 was taken out of service. Refinery wastewater was discharged from a wastewater conveyance pipe, installed to replace the TMD, directly to Pond 2 between 1987 and 1994 and directly to pond 5 between 1994 and 1999. Discharge to Ponds 2, 3, 5 and 6 was discontinued in October 1999. Navajo Refining Company began operation of an on-site wastewater treatment system that discharges to the City of Artesia Publicly Owned Treatment Works (POTW) and to a Class I injection well owned by Navajo Refining Company in

Ponds site is considered to be unlikely. In addition to the access restrictions, Navajo Refining Company's implements standard procedures to regulate construction and excavation work and to comply with federal and state health and safety regulations regarding refinery operations (Navajo Refining Company's Work Permit System). Based on the current conditions, NMED considers human exposures to be controlled at these locations.

The North Colony Landfarm (NCL) is a four-acre land treatment area located in the northwest corner of the refinery that received hazardous wastes (K049, K050, K051 and K052) between 1980 and 1990. Navajo Refining Company estimates that approximately 55,000 gallons of RCRA listed waste were applied to the landfarm. Navajo Refining Company was issued a land treatment demonstration permit for the NCL in 1989 by NMED. A land treatment permit was not issued after the land treatment demonstration permit expired in 1990 and application of waste at the unit was discontinued. Surface soil contamination is no longer present at the unit. Soil and groundwater beneath the NCL has been affected by petroleum release(s) from the adjacent tank farm (tanks 834 and 838) located south of the NCL and possibly also from the NCL. The site will be revegetated as part of fulfillment of the dust suppression requirements for post-closure care. The site is currently fenced with a locking gate. Navajo Refining Company inspects the site on a weekly basis as part of post-closure care (Navajo Refining Company Post-closure Care Permit Application, Part B (March, 2001). Human exposures at the at the NCL are controlled by compliance with the rules and restrictions implemented through the Navajo Refinery Work Permit System for compliance with health and safety regulations and adherence to Navajo's requirements and restrictions for performing construction work at the facility.

Tetra-ethyl Lead weathering site (TEL) is an approximately 0.9-acre site located in the North Plant section of the refinery that was used to treat oily wastes and other hazardous materials. It also was used historically for weathering of piping and other materials used in tetra ethyl lead processes. The materials were removed from the site after weathering. Nonhazardous wastes were placed in the TEL site between 1980 and 1983. Placement of waste in the TEL site was discontinued in either 1983 or 1989. The TEL was capped with crushed and compacted caliche overlain by imported topsoil and a vegetative cover in 1989. Closure was approved by NMEID in June 1989. Post-closure care is in effect. (Navajo Refining Company Post-closure Care Permit Application, Part B (March, 2001). Human exposures at the at the TEL are controlled by the presence of the cap and compliance with the rules and restrictions implemented through the Navajo Refinery Work Permit System for health and safety compliance and adherence to Navajo's restrictions and requirements for performing construction work at the facility.

The wastewater treatment system is permitted to discharge to a Class I injection well located on the refinery property and does not operate under a RCRA permit. The wastewater treatment system and injection well is administered through a New Mexico Department of Energy, Minerals and Natural Resources Oil Conservation Division (OCD) discharge permit that incorporates RCRA requirements for treatment, sampling and testing of the wastewater. [OCD Discharge Plan, October 1999).

SOLID WASTE MANAGEMENT UNIT SUMMARY

A SWMU Assessment will be prepared by Navajo Refining Company in accordance with the requirements of the Post-closure Care Permit currently in preparation by the NMED. The Post-closure Care Permit will require that Navajo's Artesia Refinery conduct assessments of SWMUs and AOCs identified in the permit and recommend corrective measures as necessary in a subsequent Corrective Measures Study (CMS) that evaluates corrective action options at the facility. [References: Navajo Refining Company Work Permit System (Safe Work /Hazardous Assessment (revised 2000), Hot Work (revised 1997), Confined Space Entry (revised 1997), Excavation Permit (revised 2000) and Emergency Plan (revised 2001))], Navajo Refining Company Post-closure Care Permit Application, Part B (March, 2001) and Consolidated RI/CMS Report for Three Mile Ditch and Evaporation Ponds, Navajo Refining Company (1997)]. The current refinery SWMUs are described below:

backfill the TMD. The filled ditch was covered with topsoil. Currently, the majority of the TMD crosses uncultivated land the majority of which is owned by Navajo Refining Company. Residual petroleum-related soil contamination was detected in portions of the ditch during RFI activities conducted between 1990 and 1995. The Post-closure Care Permit will, at a minimum, require removal of all soils containing residual petroleum-related soil contamination at concentrations greater than New Mexico Soil Cleanup Standards. Human exposures are controlled by the presence of the topsoil cover over the ditch and the location of the ditch in an undeveloped strip of land unlikely to be used for agricultural or other purposes. Navajo Refining Company inspects the ditch to check for disturbance of the soils. Human exposures at the at the TMD also are controlled by implementation of the Navajo Refinery Work Permit System for health and safety compliance and adherence to Navajo's restrictions and requirements for performing construction work at the facility.

SWMU #5 – Evaporation Pond #1 – Evaporation Pond 1 is located adjacent to the Evaporation Ponds regulated unit and received refinery wastewater between the early 1930s and 1987. The surface area of the pond was approximately 16 acres. Wastewater effluent was discharged from the refinery wastewater treatment system directly to Pond 1 via the TMD until 1987. In 1987, discharge to Pond 1 was discontinued and Pond 1 was taken out of service. The soils, sludge and sediments in Evaporation Pond #1 were routinely treated by aeration using a track-mounted excavator prior to 1997. RFI reports submitted by Navajo Refining Company to EPA reported that, after the soil aeration and mixing activities, light hydrocarbon and volatile organic compounds were not detected in soil samples obtained from between the ground surface and 0.5 feet below grade. Corrective action will be required at the evaporation ponds by the Post-closure Care Permit currently in preparation by NMED. The Evaporation Ponds are located in a remote area three miles east of the refinery and access is restricted from the surrounding rangeland by a six-foot high chain-link fence with a locking gate. Access to the Evaporation Ponds is restricted and their location is remote from other developed areas. The possibility of human exposure to petroleum-related contamination at the Evaporation Pond #1 site is considered to be unlikely. In addition to the access restrictions, Navajo Refining Company implements its Work Permit System to regulate construction and excavation work and to comply with federal and state health and safety regulations regarding refinery operations (Navajo Refining Company Work Permit System (Safe Work /Hazardous Assessment (revised 2000), Hot Work (revised 1997), Confined Space Entry (revised 1997), Excavation Permit (revised 2000) and Emergency Plan (revised 2001))] Based on the current conditions, NMED considers human exposures to be controlled at the Evaporation Pond #1 location.

SWMU #6 – Container Storage Area NCL – the Container Storage Area at the NCL has been removed and the area will be revegetated in conjunction with the NCL. Surface soil contamination is no longer present at the unit. Soil and groundwater beneath the NCL has been affected by petroleum release(s) from the adjacent tank farm (tanks 834 and 838) located south of the NCL and possibly also from the NCL. The site will be revegetated as part of fulfillment of the dust suppression requirements for post-closure care. The site is currently fenced with a locking gate. Navajo Refining Company inspects the site on a weekly basis as part of post-closure care (Navajo Refining Company Post-closure Care Permit Application, Part B (March, 2001). Human exposures at the at the NCL are controlled by compliance with the rules and restrictions implemented through the Navajo Refinery Work Permit System for health and safety compliance and adherence to Navajo's requirements and restrictions for performing construction work at the facility.

SWMU #16 – Old API Separator – the Old API Separator was uncovered during installation of an underground utility line. The Old API Separator has been out of the use since the early 1960s. Navajo uncovered the unit in 1998 and sandblasted the interior concrete. The sandblast grit was disposed as hazardous waste. Petroleum-related surface soil contamination associated with the Old API Separator was not observed. Further investigation will be required by the Post-closure Care Permit currently in preparation by NMED. Human exposures are controlled at this unit by restricting access to the unit, by implementation of the Navajo Refining Company Work Permit System for compliance with State and Federal health and safety regulations and Navajo's standard procedures for conducting construction work at the facility.

Footnotes:

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

[2] Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

Potential **Human Receptors** (Under Current Conditions)

"Contaminated" Media	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food[3]
Groundwater	_No	_No	_No	__Yes	_No	_No	_No
~~Air (indoors)~~	___	___	___	___	___	___	___
Soil (surface, e.g., <2 ft)	_No	_No	_No	_Yes	_No	_No	_No
~~Surface Water~~	___	___	___	___	___	___	___
~~Sediment~~	___	___	___	___	___	___	___
Soil (subsurface e.g., >2 ft)	_No	_No	_No	_Yes	_No	_No	_No
~~Air (outdoors)~~	___	___	___	___	___	___	___

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated") as identified in #2 above.

2. Enter "yes" or "no" for potential "completeness" under each "Contaminated" Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces ("___"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

_____ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

__X___ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

_____ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

There is potential for worker exposure during excavation activities at the refinery process areas and tank farms and at the following Regulated Units and SWMUs: Evaporation Ponds, NCL, TMD, Evaporation Pond #1, Container Storage Area NCL, Old API Separator [Navajo Refining Company Work Permit System (Safe Work /Hazardous Assessment (revised 2000), Hot Work (revised 1997), Confined Space Entry (revised 1997), Excavation Permit (revised 2000) and Emergency Plan (revised 2001))], Navajo Refining Company Post-closure Care Permit Application, Part B (March, 2001) and Consolidated RI/CMS Report for Three Mile Ditch and Evaporation Ponds, Navajo Refining Company (1997).

[3] Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **"significant"**[4] (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks)?

__X__ If no (exposures can not be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

There is one potentially complete exposure pathway at the Facility. The potentially complete exposure pathway scenario is that of a trench worker exposed during construction activities. Human exposures are controlled during excavation and construction activities by restricting access and activities within the refinery facility, requiring work permits that limit excavation and construction activities, implementing procedures that require conformance with health and safety requirements and by monitoring work activities throughout the refinery. Proper notification of encounters with contaminated media are part of the facility Work Permit System procedures. Interim measures and remedial action are required to be implemented if contamination in any media is encountered [Navajo Refining Company Work Permit System (Safe Work /Hazardous Assessment (revised 2000), Hot Work (revised 1997), Confined Space Entry (revised 1997), Excavation Permit (revised 2000) and Emergency Plan (revised 2001)]

[4] If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

5. Can the "significant" **exposures** (identified in #4) be shown to be within **acceptable** limits?

_____ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

_____ If no (there are current exposures that can be reasonably expected to be "unacceptable")- continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

_____ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale and Reference(s):_____

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

_YE_ YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the _____ facility, EPA ID #_____, located at _____ under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

____ NO - "Current Human Exposures" are NOT "Under Control."

____ IN - More information is needed to make a determination.

Completed by (signature)_____ Date _____
(print)
(title)

Supervisor (signature) [signature] Date 6/8/01
(print) STEPHEN FOLLIN
(title) WZES I
(EPA Region or State) N MEXICO

Locations where References may be found:

Navajo Refining Company, Artesia Refinery
U501 East Main Street, Artesia, New Mexico 88210

New Mexico Environment Department Hazardous Waste Bureau
2905 Rodeo Park Drive East Building 1, Santa Fe New Mexico 87505

Contact telephone and e-mail numbers

(name) Dave Cobrain
(phone #) [signature]
(e-mail) david_cobrain@nmenv.state.nm.us

FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.