

# TECHNICAL REPORT ON THE PALANGANA AND HOBSON URANIUM IN-SITU LEACH PROJECT DUVAL AND KARNES COUNTIES, TEXAS

Palangana Property: 27°37'38"N, 98°24'22"W  
Hobson Plant: 28°56'41"N, 97°59'20"W

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## **TABLE OF CONTENTS**

1.0	Summary	1
2.0	Introduction and Terms of Reference	4
3.0	Disclaimer	6
4.0	Property Descriptions and Locations	7
4.1	Palangana Property	7
4.1.1	DeHoyos Lease	8
4.1.2	Schallert Lease (La Palangana Ranch)	9
4.2	Hobson Plant Site	11
5.0	Physiography, Climate, Accessibility, Local Resources, and Infrastructure	11
5.1	Palangana Property	12
5.2	Hobson Plant	12
6.0	History	13
6.1	Palangana Property	13
6.1.1	Discovery and Early Exploration – Columbia Southern Inc.	13
6.1.2	Property Evaluation & Initial Development – Union Carbide Corp.	13
6.1.3	Exploration and ISL Production – Union Carbide Corp.	14
6.1.4	Everest Evaluation	15
6.1.5	Exploration and Reclamation – Chevron Resources	16
6.1.6	General Atomics Corp. (Rio Grande Resources Inc.)	16
6.1.7	Everest Lease Acquisitions	17
6.2	Hobson Plant	17
7.0	Geologic Setting	19
7.1	Regional Geology	19
7.2	Local and Property Geology	20
8.0	Deposit Type	21
9.0	Mineralization	21
10.0	Exploration	22
11.0	Drilling / Sampling / Analysis / Security	23
11.1	General Discussion	23
11.2	Rotary Drilling and Logging	23

11.2.1	Standard Practices	23
11.2.2	UCC Rotary Drilling	24
11.2.3	Chevron Rotary Drilling	24
11.3	Core Drilling, Sampling, and Assaying	24
11.3.1	Standard Practices	24
11.3.2	UCC Core Drilling	25
11.3.3	Chevron Core Drilling	26
11.4	Down-hole Logging and Gamma Probe Calibration	26
11.4.1	Standard Practice	26
11.4.2	UCC Down Hole Logging	27
11.4.3	Chevron Down-Hole Logging	28
11.4.4	Discussion of Disequilibrium Factor	28
11.5	Comments on Drilling Results	29
11.6	Comments on Sample Security	30
12.0	Data Verification	30
13.0	Adjacent Properties	31
14.0	Mineral Processing and Metallurgical Testing	31
14.1	Overview of ISL Uranium Mining	31
14.2	Overview of ISL Uranium Processing	32
14.3	Overview of ISL Uranium Restoration	33
14.4	Palangana Deposit Characteristics Relevant to ISL	34
14.5	Palangana Past Production and Analog Deposits	35
15.0	Mineral Resource Estimate	36
16.0	Additional Information for Palangana – Hobson Project	38
16.1	Mining Operations	38
16.2	Environmental and Permitting	38
17.0	Conclusions	41
18.0	Recommendations And Budget	42
19.0	References	44
20.0	Figures (see listing below)	46
21.0	Appendices	72
22.0	Certification & Consent of Author	75

## **Tables**

Table 4.1	DeHoyos Royalty Schedule	9
Table 4.2	Schallert Royalty Schedule	11
Table 6.1	1957 UCC Palangana historic resource	13
Table 6.2	1979 UCC Palangana historic resource	14
Table 6.3	1980 Everest Palangana historic resource	15
Table 6.4	1983 Chevron Palangana historic resource	16
Table 6.5	Historic Hobson Plant Yellowcake Production	18
Table 15.1	Palangana 43-101 inferred resource	38
Table 18.1	Phase 1: Acquisition, Permitting, Environmental, and Drilling	42
Table 18.2	Phase 2: Development and Exploration Drilling, Permitting, Environmental	42

## **Figures**

Figure 2.1	Western United States Project Location Map
Figure 4.1	South Texas location map for Palangana-Hobson Project.
Figure 4.2	Palangana property land status map
Figure 4.3	Hobson plant land status map.
Figure 5.1	Palangana property location and access map
Figure 5.2	Hobson plant location and access map
Figure 6.1	Oblique air photo of Hobson plant circa mid-1980's.
Figure 7.1	South Texas Uranium Belt Geology, deposits, and project location.
Figure 7.2	South Texas Uranium Belt stratigraphic column.
Figure 7.3	Palangana dome topographic expression and reference line for geologic section.
Figure 7.4	Palangana Dome idealized geologic section.
Figure 7.5	Goliad Formation Palangana Dome stratigraphic section.
Figure 8.1	Idealized model of Palangana sandstone-hosted roll front uranium mineralization.
Figure 9.1	Palangana UCC & Chevron drill hole location map with lines of section.
Figure 9.2	East-west section A-A' showing roll front mineralization.
Figure 9.3	East-west section B-B' showing roll front mineralization.
Figure 9.4	Southwest-northeast section C-C' showing roll front mineralization.
Figure 11.1	Palangana UCC drill hole location map on air photo.
Figure 11.2	Palangana UCC & Chevron drill hole location map on air photo.
Figure 11.3	UCC & Chevron drill holes by maximum grade intercept.
Figure 14.1	Schematic of Palangana ISL wellfield configuration.
Figure 14.2	Palangana-Hobson project in-situ leach uranium generalized process flow schematic.
Figure 15.1	Palangana mineral resource polygon, eU <sub>3</sub> O <sub>8</sub> grade map.
Figure 15.2	Palangana mineral resource polygon, thickness map.
Figure 15.3	Palangana mineral resource polygon, GT map.



## 1.0 SUMMARY

The Palangana-Hobson uranium in-situ leach (ISL) project occurs in the South Texas Uranium Belt between San Antonio and Corpus Christi. Located in Duval County, the Palangana property hosts one of the larger, undeveloped uranium deposits in south Texas. The Hobson plant, in Karnes County, approximately 100 miles north-northeast of Palangana, is the site of the central ISL processing facility. Palangana is planned to operate as a satellite ion exchange loading facility to Hobson. The Palangana property is held under two mining leases. The Hobson plant site is held under a 100% fee ownership subject to a Life Estate remainderman interest. South Texas physiography is characterized by a subtropical climate and low gentle relief with elevations of 300 to 500 feet above sea level, thereby supporting year-long mining operations.

Uranium mineralization at Palangana was discovered in 1952 during potash exploration drilling on the Palangana salt dome. Mineralization occurs as a series of roll front-type deposits within the Pliocene Goliad Formation. The Goliad is one of several Tertiary formations, primarily of fluvial origin, hosting uranium in the South Texas Uranium Belt. The roll front mineralization occurs in a permeable, 100-foot thick sandstone sequence at depths of 250 to 350 feet. This mineralized horizon is confined by mudstones at its upper and lower boundaries.

Union Carbide Corp. (UCC) acquired the property in 1958 and initiated underground mine development. Development work was quickly abandoned due to heavy concentrations of H<sub>2</sub>S gas and UCC dropped the property. UCC subsequently reacquired Palangana in 1967 after recognizing that it would be amenable to exploitation by newly emerging ISL mining technologies. UCC drilled over 4,000 exploration, development and production holes at Palangana from the late 1950s through the late 1970s. In 1979, UCC reported a non-NI 43-101 compliant resource of 2,026,000 tons averaging 0.19% eU<sub>3</sub>O<sub>8</sub> yielding 7,697,000 pounds of U<sub>3</sub>O<sub>8</sub>. This historic resource is reliable and relevant, and is considered to be equivalent to the CIM inferred resource category. UCC's ISL production efforts from 1977 to 1979 were focused in a 30.7 acre area. The results were disappointing, with approximately 340,000 pounds of U<sub>3</sub>O<sub>8</sub> production representing a 32% to 34% recovery rate. The low recoveries have been attributed to unfamiliarity with ISL technologies that were relatively new at the time, poorly understood geologic controls on mineralization, and curtailment of operations prior to depletion of the resource. UCC placed the property leases up for sale in 1980.

Everest Exploration Inc. evaluated Palangana in 1980 and estimated a historic resource outside of the UCC ISL wellfield area of 1,330,000 tons averaging 0.182% eU<sub>3</sub>O<sub>8</sub> giving 4,840,000 million pounds of U<sub>3</sub>O<sub>8</sub>. This historic resource is reliable and relevant, and is considered to be equivalent to the CIM inferred resource category. Assessment of the environmental restoration

liabilities resulting from UCC's mining operations discouraged Everest from pursuing the acquisition further.

Chevron Resources USA Inc. (Chevron) acquired the property from UCC in 1980 with the intention of developing an open pit mine. Chevron estimated an open pit historic resource in 1983 of 3,229,000 tons grading 0.125 eU<sub>3</sub>O<sub>8</sub>%, yielding 8.1 million pounds U<sub>3</sub>O<sub>8</sub>. This included resources remaining in the UCC ISL wellfield area. Chevron abandoned development of the property due to the low uranium prices prevalent in the early 1980s and initiated restoration activities. In 1991, General Atomics Corp. acquired all of Chevron's uranium assets, including Palangana, but did not advance the property with further exploration or production. Instead General Atomics completed Texas state reclamation requirements in 1995 and subsequently dropped the property leases. Everest acquired the leases in January 2005 during the recent resurgence in the price of uranium.

The author has estimated a 43-101 compliant inferred resource for Palangana, outside of the UCC ISL wellfield area, from the UCC and Chevron drill data as follows:

**1,906,000 tons averaging 0.15% eU<sub>3</sub>O<sub>8</sub>, yielding 5,701,000 pounds of U<sub>3</sub>O<sub>8</sub>.**

The eU<sub>3</sub>O<sub>8</sub>% grades from the UCC and Chevron drilling and gamma ray logging appear to be reliable and relevant. However, UCC systematically underestimated intercept thicknesses. As a result, the resource estimate is probably conservative. Further due diligence assessment of the historic drill results could justify reclassifying some of these resources into the indicated and measured categories. Uranium mineralization as currently defined by historic drilling remains open laterally in all directions, providing excellent potential to add to the resource base with additional drilling. Recent U<sub>3</sub>O<sub>8</sub> production recoveries at a nearby ISL operation ranged from 85% to 95%, and a conservative assumption for a Palangana ISL operation is 80% recovery.

Everest Exploration Inc. (EEI) constructed the Hobson uranium oxide (yellowcake) processing plant in 1979 and began ISL production from a nearby property. From initial production through 1988, EEI operated the Hobson facility and three satellite mining operations producing approximately 2,920,000 pounds of yellowcake. The Hobson plant is a significant production asset with an operating license that is still in effect. However, the cold-standby status of the Hobson facility over the last seventeen years will necessitate the rehabilitation, or replacement, of some components. The nominal capacity of the Hobson facility is +500,000 pounds U<sub>3</sub>O<sub>8</sub>/year, but an upgrade to one million pounds per year could be achieved with minimal capital investment.

Palangana is a property of merit that warrants additional work and investment, and the Hobson processing facility provides a current operating

license, and with rehabilitation, the infrastructure necessary for yellowcake production. The following program is recommended and divided into two six-month periods.

	<u>USD M\$</u>
• <u>PHASE I</u>	
Permitting, environmental, confirmation drilling, rehab	3.48
• <u>PHASE II</u> ( <i>contingent on successful completion of Phase I</i> )	
Development/exploration drilling, permitting, environmental	1.76

In addition to the project's potential to quickly progress to the development and production levels, there is also significant upside exploration potential at Palangana that could add to the current NI 43-101 resource base.

## 2.0 INTRODUCTION AND TERMS OF REFERENCE

Standard Uranium Inc. (URN) retained the author, Mr. Robert E. Blackstone (Wyoming CPG #1588 to complete an independent NI 43-101 technical review of the Palangana-Hobson In Situ Leach (ISL) Project located in the South Texas Uranium Belt (Figure 2.1). This assessment includes estimation of NI 43-101 compliant resources based upon historical drilling results. The objective is to provide a technical review as a component of URN's due diligence determination of whether the project merits acquisition of the Palangana uranium resource and Hobson ISL processing plant from Everest Exploration Inc. and Everest Resources Company (collectively "Everest"). The terms of this acquisition are summarized in URN's press release dated October 11, 2005 and outlined in the binding letter of intent signed by URN and Everest. Further discussion on the details of this business arrangement are beyond the scope of this technical review.

This report is based upon published geologic reports, unpublished company reports and data, personal communication with Everest employees and expert consultants familiar with the project, and from personal experience. The unpublished company reports and data were initially reviewed on site and at Everest's Corpus Christi office. Key reports, maps, and data were selected and copied for more detailed review and analysis by the author. This information dates from the initial Palangana discovery in the 1950s to work conducted up to the mid-1990s, and as such pre-dates NI 43-101 requirements and CIM best practices. Further, the immense volume and non-digital nature of the historic exploration and production data precludes a comprehensive data review, and therefore this technical review is preliminary in nature.

The author visited the Palangana property and Hobson plant facilities on August 25, 2005, with a follow-up visit to the Everest offices in Corpus Christi on August 26, 2005. Extensive reclamation work has been completed on the Palangana property, and as a result, historic drill pads cannot be located and drill cuttings have been removed. In addition, core from diamond drilling had been disposed of as part of the reclamation effort. The uraniferous ore horizons occur at depths of approximately 250 to 350 feet. Therefore, the author could not independently surface sample and confirm the deposit's reported tenor nor map or observe the extent of uranium mineralization.

Units of measure and conversion factors used in this report include:

### **Linear Measure**

1 inch	= 2.54 centimeters
1 foot	= 0.3048 meter
1 yard	= 0.9144 meter
1 mile	= 1.6 kilometers

### **Area Measure**

1 acre	= 0.4047 hectare	
1 square mile	= 640 acres	= 259 hectares

### **Weight**

1 short ton	= 2000 pounds	= 0.907 tonne
1 pound	= 0.454 kilogram	

Definitions of uranium industry-specific technical terms used in this report include:

**cU3O8 (Chemical U3O8):** Uranium assay as determined from chemical analysis.

**Closed Can Assay:** A common form of disequilibrium is caused by radon loss, which can be measured by a “closed can” assay (in early documents called a “radioassay” by Union Carbide). An eU3O8 assay is generated by sealing an ore sample in an airtight container for several days to permit radon-222 and its immediate short-lived daughters to equilibrate. A count rate is then converted to eU3O8 for comparison against a chemical U3O8 assay and estimate of disequilibrium.

**Dead Time:** When a gamma ray detector (probe) detects the presence of a gamma ray, there is a measurable amount of time required for the detector and the electronics, both at the probe and in the logging truck, to record the event. During that time, the equipment is not capable of processing another event. When detection events come close together in time, for example in high grade uranium zones, this “dead time” limits system performance and must be corrected for. One of the characteristics of a good logging unit is very low instrument dead time.

**Disequilibrium:** An imbalance between the uranium content and the radioactivity emitted by a given volume of mineralized rock. This imbalance is caused by either differential mobilization of the more soluble uranium from the deposition site, relative to its daughter isotopes, or by a lack of time for the accumulation of the daughter isotopes to reach a state of equilibrium after the uranium has been deposited. Generally, when the decay series is in equilibrium, the gamma plus beta radiation is proportional to the amount of uranium present.

**eU3O8 (Equivalent U3O8):** A DEF uncorrected uranium assay as calculated from a gamma ray detection device.

**GT:** A common industry measurement of uranium value of a downhole gamma (or chemical) interval calculated by multiplying grade in %U3O8 by thickness. Various GT values are commonly used as a cutoff in reserve/resource calculations.

**In Situ Leach (ISL):** Removal of the valuable components of a mineral deposit without physical extraction of the rock. The orebody must be permeable to the leach solutions and situated such that ground water in proximity will not be contaminated by mining operations.

**Ion Exchange:** Ion exchange is a reversible chemical reaction wherein a charged ion (an atom or molecule that has lost or gained an electron and thus acquired an electrical charge) in solution is exchanged for a similarly charged ion attached to an immobile solid particle, in this case, a synthetic organic resin.

**K Factor:** A factor determined for each radiometric logging apparatus in order to Standardize Equivalent Assays. Each logging unit, probe, etc. must be individually calibrated to determine its own K Factors. K Factors can be determined from specially designed calibration pits, reference sources or cored holes. If cored holes are utilized, core recovery must be close to 100%, and core assays must be representative of the full range of assay data.

**Lixiviant:** Also called leachate; the active leach solution for carrying uranium into an aqueous solution.

**Reverse Osmosis (RO):** Reverse osmosis is a water purification system. RO uses a special semi-permeable membrane that allows the fluid that is being purified to pass through it, while rejecting the contaminants that remain.

**Water Factor:** A correction factor related to borehole diameter and attenuation of gamma by borehole fluid.

### **3.0 DISCLAIMER**

This report primarily relied on data and information from internal company reports of the previous property owners and plant operators, including Columbia Resources Inc. ("CRI"), Union Carbide Corporation ("UCC"), Chevron Resources USA Inc. ("Chevron"), and Everest Exploration Inc. and Everest Resources Corp. (collectively "Everest"). This information was supplemented by personal communication with qualified geologic, mining, and processing experts familiar with the Palangana property and Hobson plant.

All of the historic work was conducted prior to implementation of the NI 43-101 requirements and CIM best practices standards. However, the scope of work ranged from initial discovery and exploration in the 1950's, to extensive exploration and initial U3O8 ISL production by UCC from 1977 to 1979. As well, there was follow-up exploration and due diligence work by both Everest and Chevron into the early 1980's. From critical review, these exploration and production activities followed the industry standard best practices in place at the time. In addition, the volume of work performed yielded extensive geologic, drill log, and ISL mining data and information, albeit in analog hardcopy format. However, the information, while voluminous, is not necessarily comprehensive given the vagaries of data archival and storage over a 50 year time span. The Everest data archives require additional systematic review that could take up to a man-year or more to complete; this effort is beyond the scope of this study. Further, essentially none of the project information is in digital format, and hence timely, thorough, and rigorous data analysis was often impeded. Regardless, the information available has been critically reviewed by the author, and based upon both the quality and quantity of the historic work performed is deemed to be both relevant and reliable for the purpose of this report.

The author has extensive professional experience in uranium exploration and mining, with specific expertise in economic geology as well as mine development and production. However, the author's experience does not include expertise in land, legal, or environmental matters. Therefore, any opinions rendered on legal, land status, or environmental issues in this report are general in nature and drawn on field observations, reports, documents, and discussions with independent expert consultants as well as Everest personnel.

## **4.0 PROPERTY DESCRIPTIONS AND LOCATIONS**

The Palangana uranium property is in Duval County, Texas, 25 miles west of the town of Alice. The Hobson plant is in Karnes County, Texas, near the small town of Hobson. The two projects are approximately 100 miles apart (Figure 4.1).

### **4.1 Palangana Property**

(See Figure 4.2)

Everest Resources Company holds 100% of the Mineral Rights and Surface Use Rights to the Palangana property under two In-Situ Mining leases, both of which have been reviewed in detail:

- a) The first is between Everest Resources Company, lessee, and Zulema DeHoyos et al, lessors, covering 3100.64 acres dated January 14, 2005 (herein referred to as the DeHoyos lease).

- b) The second is between Everest Resources Company and KDH Operations Ltd. (a Texas limited partnership and internal Everest partner who acted as the lease bank for the leasing activity), lessees, and La Palangana Ranch LLC, lessors, a Texas limited liability company, covering 3100.64 acres dated April 1, 2005 (herein referred to as the Schallert lease).

The two leases are contiguous, with Schallert on the north and DeHoyos on the south. The center of these tracts is at 27° 37' 38" north latitude and 98° 24' 22" west longitude. Both tracts have been legally surveyed and recorded in the deed books of Duval County (Everest personal communication, Clark, 2005).

#### **4.1.1 DeHoyos Lease**

The DeHoyos lease, constituting a single block, is located approximately six miles north of Benavides and 12 miles southwest of San Diego in Duval County, Texas. Title to the land is contained and reserved in Book 61, pages 285-289 of the Deed Records of Duval County, Texas, and is a portion of the tract of land known as the Palangana Pasture allotted to Mrs. Lizzie Singer under terms of the will of Mrs. Anna Collins, deceased, and decree of the District Court of Nueces County, Texas, and being Share 4 of Parcel F, First, and Parcel F, Second, and which decree is of record in Volume Z, page 314 et. seq., Deed Records of Duval County, Texas, and described by the metes and bounds contained therein.

1. The lease has a five-year primary term and is held by production or efforts by lessee to establish or reestablish production. The lease can be extended for a Renewal Term of five years upon payment of a \$75/acre bonus.
2. An annual rental of \$10/acre is payable during the time the Primary and Secondary Terms are in effect but no mining is in progress.
3. Everest has all right and title to conduct all activities necessary to explore, develop and mine. Specifically granted are: investigating, exploring, prospecting, drilling, solution mining, producing, extracting, milling, treating, processing, upgrading, removing, transporting, stockpiling and storing uranium, thorium and other fissionable or spatially associated substances. Rights to build roads, pipelines, utilities, processing structures and other necessary facilities are also granted.
4. Lessor reserves oil, gas and hydrocarbon mineral rights and the right to use and lease the surface.
5. Lessee has the right to pool and commingle uranium or other leased substances.
6. The lease can be assigned.
7. "Shut-In Royalty" provision. This provision states that if lessee deems there is commercially recoverable uranium but has not produced by



the end of the Primary or Renewal Term, or if lessee halts production because of market reasons, lessee can continue the lease in force through payment of a "Shut-In Royalty" of \$10/acre for a maximum of two years, which do not have to be consecutive.

8. The lease contains provisions for continuing the lease in force for 90 days after expiration of the Primary or Renewal Term if lessee is engaged in efforts to begin operations (or resume operations if interrupted) that result in production. In addition, if production is halted during the Primary or Secondary Term, the lease can continue to be held if lessee resumes payment of Rental as described above.
9. Lessor to have access to all records pertinent and necessary for substantiating compliance of lessee with provisions of the lease, including: production records, assays and evaluation ore records, and all other records pertinent and necessary.
10. Lessor is due \$25 per exploration hole and a one-time payment of \$250/acre for acreage taken out of use.
11. Lessee shall not be liable for delays or defaults due to force majeure.
13. Royalties for the Schallert tract are set forth in the following table. Lessee has the right to take its royalty in kind provided that any such election must be for a minimum of one year.

**Table 4.1 DeHoyos Royalty Schedule**

<b>U3O8 \$/lb Sold (Net Sales Proceeds)</b>	<b>Royalty Percent</b>
Less than \$35	7%
\$35.01 to less than \$45.00	8%
\$45.01 to less than \$50.00	9%
\$50.01 or more	10%

As far as is known the property has no environmental liabilities. The Union Carbide in-situ leach field and plant site, partially on the DeHoyos tract, have been fully restored and reclaimed. Mining permits and wellfield permits must be obtained from the State of Texas prior to constructing a satellite process plant on the property and drilling and constructing wellfields. Permits for exploration are also required.

#### **4.1.2 Schallert Lease (La Palangana Ranch)**

The Schallert mineral rights lease is limited to depths from the ground surface to 1,500 feet. The lease is in Duval County, Texas. The 3100.64 acres is described as Share 3, Parcel F-2, allotted to Robert Schallert in the decree of partition rendered by the District Court of Nueces County, Texas, on August 8, 1908 (Robert Schallert, et al vs. Chas. Hoffman, et al), which decree is incorporated by reference into the lease. Pertinent provisions are:

1. The lease has a five-year Primary Term and is held by production thereafter and a Secondary Term of five years upon payment of a \$60/acre bonus.
2. An annual rental of \$10/acre is payable during the time the Primary and Secondary Terms are in effect but no mining is in progress.
3. Surface usage payments of \$50 per exploration hole and \$650/acre for acreage taken out of use.
4. Everest has all right and title to conduct all activities necessary to explore, develop and mine. Specifically granted are: investigating, exploring, prospecting, drilling, solution mining, producing, extracting, milling, treating, processing, upgrading, removing, transporting, stockpiling and storing uranium, thorium and other fissionable or spatially associated substances.
5. Lessor reserves oil, gas and hydrocarbon mineral rights and the right to use and lease the surface. Lessor further prohibits use of the leased premises for disposal of any tailings or waste liquid or material from its operations, laying pipeline, building roads, power lines and other utilities or processing structures except as expressly authorized in the lease.
6. Lessee has the right to pool and commingle uranium or other leased substances.
7. The lease can be assigned.
8. "Shut-In Royalty" provision. This provision states that if lessee deems there is commercially recoverable uranium but has not produced by the end of the Primary or Renewal Term, or if lessee halts production because of market reasons, lessee can continue the lease in force through payment of a "Shut-In Royalty" of \$10/acre for a maximum of two years, which do not have to be consecutive.
9. The lease contains provisions for continuing the lease in force for 90 days after expiration of the Primary or Secondary Term if lessee is engaged in efforts to begin operations (or resume operations if interrupted) that result in production. In addition, if production is halted during the Primary or Secondary Term, the lease can continue to be held if lessee resumes payment of Rental as described above.
10. Lessor to have access to all records pertinent and necessary for substantiating compliance of lessee with provisions of the lease, including: production records, copies of all data developed on the property, logs, tests, assays, reservoir studies, and reports to government agencies. Lessor shall also be entitled to receive copies of sales agreements and contracts, which will be held confidential for two years except when required by lessors representatives for audit, which release will be under a confidentially agreement with said representatives.
12. Lessee shall not be liable for delays or defaults due to force majeure.

13. Royalties for the Schallert tract are set forth in the following table. Lessee has the right to take its royalty in kind provided that any such election must be for a minimum of one year.

**Table 4.2 Schallert Royalty Schedule.**

U3O8 \$/lb Sold (Net Sales Proceeds)	Royalty Percent
\$25 or less	7%
\$25.01 to less than \$30.01	8%
\$30.01 to less than \$40.01	9%
\$40.01 or more	10%

As far as is known the property has no environmental liabilities. The Union Carbide in-situ leach field and plant site, partially on the DeHoyos tract, have been fully restored and reclaimed. Mining permits and wellfield permits must be obtained from the State of Texas prior to constructing a satellite process plant on the property and drilling and constructing wellfields. Permits for exploration are also required.

#### **4.2 Hobson Plant Site**

(See Figure 4.3)

Everest is the 100% owner of the Hobson plant site covering 7.286 acres subject to a Life Estate remainderman interest to Mary M. Moczygemba (Vol. 165, Page 448, Deed Records of Karnes County, Texas). Upon the death of Mary Moczygemba, a one-half interest in the site will flow through Mary Moczygemba's husband's will (previously deceased) to a James Allen Kruciak. At that time the surface will be 50% Everest and 50% Kruciak. Everest has an ongoing lease for the unowned 50% or can acquire Kruciak's interest (Everest personnel, 2005).

The Hobson plant is on standby and is currently licensed for operation. The administrative component of the Radioactive Material License (RML No. L03626) is current through December 31, 2006.

The Hobson WDW site (WDW-168) is owned 100% by Everest and located on non-contiguous property approximately 0.75 miles northwest of the Hobson plant site. The WDW is connected to the plant site via an easement of approximately 1.25 miles.

### **5.0 PHYSIOGRAPHY, CLIMATE, ACCESSIBILITY, LOCAL RESOURCES, AND INFRASTRUCTURE**

South Texas physiography is characterized by very low, gentle relief amenable to mining operations. The elevation at Palangana, approximately 65

miles from the Gulf Coast center of Corpus Christi, is approximately 500 feet ASL. The elevation at the Hobson facility is 330 feet above sea level.

The region's subtropical climate allows uninterrupted, year-round mining operations. Temperatures during the summer range from 75° to 95° F, although highs above 100° F are not uncommon; winter temperatures range from 45° to 65° F. Humidity is generally over 85% year-round, and commonly exceeds 90% during the summer months. Average annual rainfall is 30 inches.

The main industries are oil and gas production followed by agriculture, ranching and tourism. The predominance of the oil and gas industry in the region assures that local resources for drilling, construction, and support for mining and exploration activities are readily available.

## **5.1 Palangana Property**

The Palangana property, in Duval County, falls near the center of a triangle formed by the towns of Alice 25 miles east, Freer 15 miles northwest and Benavides 6 miles south (Figure 5.1). Freer and Benavides are small rural agricultural towns with populations of 3,200 and 1,700 respectively. Alice, population 19,000, is the seat of adjoining Jim Wells County and the largest nearby town. Access is excellent, with major two lane roads connecting the three surrounding towns and dirt secondary roads connecting Palangana to these. Corpus Christi, 65 miles east, is the largest metropolitan district.

The Palangana property has ample room for all operations and a deep waste disposal well (WDW-168) is located approximately 1000 feet to the west of, and connected to the plant site by a pipeline. Electrical power is in place for the WDW. Three-phase power is available on-site. Outside of a series of wastewater tanks or a small wastewater holding pond, no waste disposal area or tailings impoundment is required for a renewed Palangana operation (Everest personal communication, Clark, 2005).

## **5.2 Hobson Plant**

The Hobson Central Plant is located one mile south of the small town of Hobson in Karnes County, Texas, along Farm Road 81 (Figure 5.2). The nearest substantial towns are Karnes City (population 3,500) seven miles southeast of Hobson, and Kenedy (population also 3,500) five miles southeast of Karnes City. Corpus Christi is 97 miles southeast and San Antonio is 40 miles northeast of Hobson. Access is excellent with Hobson, Karnes City and Kenedy all lying along U.S. Highway 181, which connects San Antonio with Corpus Christi; Interstate Highway 37, also connecting San Antonio and Corpus Christi, parallels U.S. 181, 13 to 30 miles to the west.

## **6.0 HISTORY**

### **6.1 Palangana Property**

The Palangana property occurs in a region of south Texas that has a long history of natural resource exploitation, including oil and gas, brine, and sulfur operations. Uranium mineralization at Palangana occurs in the fluvial clastic sequences of the Pliocene Goliad Formation, and is situated over the Palangana salt dome that attracted early exploration activity.

#### **6.1.1 Discovery and Early Exploration – Columbia Southern Inc.**

Uranium mineralization was discovered during potash exploration drilling of the Palangana Dome's gypsum-anhydrite cap rock in 1952 by Columbia Southern Inc. (CSI), a subsidiary of Pittsburgh Plate Glass Corp. CSI conducted active uranium exploration drilling on the property starting in March 1956 (UCC internal document).

Records of CSI's exploration work are unavailable. However, underground mineable uranium resources were estimated by both CSI and the U.S. Atomic Energy Commission (AEC). The only known details of the estimation method include a 0.15% eU<sub>3</sub>O<sub>8</sub> cutoff grade, a minimum mining thickness of three feet, and widely spaced drilling on a nominal 200 foot exploration grid. Due to a lack of supporting information, these resources are not considered reliable, and therefore are not reported. However, the fact that both CSI and the AEC, a very reputable United States government agency, were compelled to estimate resources indicates that the potential mineability of Palangana was recognized even during the earliest years of exploration.

#### **6.1.2 Property Evaluation and Initial Development – Union Carbide Corp.**

UCC leased the Palangana property in 1958. An internal UCC report (R. W. Scheevel, A Study of the Uranium Ore Reserves, Palangana Dome, Duval County, Texas, Nov. 29, 1957) estimated historic open pit "indicated plus inferred" resources (internal UCC categories) based upon a cutoff grade of 0.04% eU<sub>3</sub>O<sub>8</sub> and minimum thickness of three feet as given in Table 6.1.

**Table 6.1. 1957 UCC Palangana historic resource.**

<b>Tons</b>	<b>Avg eU<sub>3</sub>O<sub>8</sub> %</b>	<b>Pounds U<sub>3</sub>O<sub>8</sub></b>	<b>Avg Thickness (ft)</b>
2,953,000	0.16	9,449,000	7.0

The "Indicated" resources were defined by an area of influence 50 feet around outside ore holes toward barren holes and 100 feet for inside ore holes toward other ore holes. "Inferred" resources were estimated similarly but with a maximum radius of 200 feet. Probing was done with a Century logger with no

disequilibrium factors applied, although the condition was recognized. UCC noted that densities ranged from 12.2 to 17.1 cubic feet/ton (CF/T), and that a factor of 14.8 CF/T was a reasonable figure to use for tonnage estimation (Scheevel report). UCC estimated additional “potential” resources of 2 to 6 million pounds of U<sub>3</sub>O<sub>8</sub>. These historic resources are pre-NI 43-101 but are believed to be relevant and reliable. These resources are all placed into the CIM “inferred” resource category.

UCC initiated property development for underground mining, but abandoned the project due to encountering unstable ground and heavy concentrations of H<sub>2</sub>S gas, not a unique occurrence in the Gulf Coast salt dome geologic environment. UCC subsequently dropped the property lease and exploration and development work at Palangana went into a period of hiatus.

### **6.1.3 Exploration and ISL Production – Union Carbide Corp.**

UCC reacquired the Palangana property in 1967 after recognizing that uranium mineralization occurred in ISL amenable roll front-type deposits. ISL technology was in the research and development phase at the time and had not been successfully demonstrated as a commercially viable mining method. UCC conducted a small pilot ISL operation from 1969 to 1970 using push-pull ISL methods (consisting of injecting and producing from the same well). This pilot operation yielded 12,000 pounds of uranium yellowcake (UCC internal document). The plant was dismantled and the project abandoned in 1970.

After a five year hiatus, during which ISL mining technologies matured and became more economically feasible, UCC reinitiated its efforts at Palangana. This work consisted of exploration drilling in 1975 and construction of an on-site 220,000-pound/year ion exchange plant in the 1976 to 1977 timeframe followed by drilling and operation of ISL wellfields from January 1977 through October 1979. Approximately 1,800 injection-production wells were installed in a 30.7-acre area with 1,150 outlying monitor wells (UCC internal document).

An internal UCC report in 1979 (author unknown) reported historic “measured-indicated-inferred” resources (internal UCC categories) at a cutoff grade of 0.10% eU<sub>3</sub>O<sub>8</sub> and GT (grade times thickness) cutoff of 0.30 foot-eU<sub>3</sub>O<sub>8</sub>%:

**Table 6.2. 1979 UCC Palangana historic resource.**

<b>Tons</b>	<b>Avg eU<sub>3</sub>O<sub>8</sub> %</b>	<b>Pounds U<sub>3</sub>O<sub>8</sub></b>
2,026,000	0.19	7,697,000

These resources were estimated employing the polygonal block method. The UCC measured and indicated resource categories were based on confidence levels derived from drill intercept densities in the mineralized zones:

- a) Measured resources were defined within a maximum 75 foot area of influence between drill holes with GT values greater than or equal to 0.30 ft-eU3O8%.
- b) Indicated resources were defined within a maximum 150 foot area of influence between drill holes with GT values greater than or equal to 0.30 ft-eU3O8%. The estimated tons were arbitrarily reduced by 20%.
- c) Inferred resources were defined within a maximum 150 foot area of influence between drill holes with intersections greater than or equal to 0.02% eU3O8. The estimated tons were arbitrarily reduced by 50%.

As is presently understood, UCC used a disequilibrium factor (DEF) of 1.17 to adjust the eU3O8 grades for the resource estimation. However, the DEF ratio was reported to vary from 0.5 to over 2.0 for the deposit. UCC also used a host rock bulk density of 17.0 cubic feet/ton based on drill core data density data. These historic resources are pre-NI 43-101 but are believed to be relevant and reliable. Until further review and due diligence these resources are placed into the CIM “inferred” resource category.

The UCC Palangana ISL production results were poor. Production is variously described as 318,000 to 340,000 pounds of U3O8 from the 30.7-acre resource area that was reported to contain approximately 1,000,000 pounds of eU3O8 (UCC internal document). The reasons cited for the low recovery (i.e., approximately 32% to 34%) are varied and include a lack of understanding of the optimum ISL extraction chemistry, inadequate definition of the geologic controls on uranium mineralization, utilization of the push-pull production technique that was both expensive and ineffective, and closure prior to completion of mining. In 1980, UCC put the Palangana property lease up for sale.

#### 6.1.4 Everest Evaluation

Everest evaluated the Palangana property in 1980, and estimated a resource based upon the UCC drill data (Table 6.3). The Everest resource was estimated at a GT cutoff of 0.50 feet-eU3O8%. Their estimation did not include the UCC ISL production wellfield that Everest attributed to contain a residual 400,000 pounds of U3O8. This historic resource is considered to be reliable and relevant, and is considered to be equivalent to the CIM inferred resource category.

**Table 6.3. 1980 Everest Palangana historic resource.**

<b>Tons</b>	<b>Avg %eU3O8</b>	<b>Pounds U3O8</b>
1,330,000	0.182	4,840,000

Everest also recognized Palangana's upside exploration, but only drilled six wide-spaced exploration holes as follow-up. Restoration liabilities concerning the decommissioned Palangana production wellfield dissuaded Everest from pursuing the lease purchase further (Oman personal communication, 2005).

#### **6.1.5 Exploration and Reclamation – Chevron Resources**

Chevron acquired the Palangana leases from UCC in 1981. Chevron was very active at the time in conventional open pit uranium mining in south Texas and expected that the ISL wellfield reclamation issues would be circumvented by simply mining the material as part of a larger open pit.

A 1983 Palangana cost study for open pit mining by Chevron (internal company memo, Ettlinger to Bailey, 8/17/83) reported a historic "reserve" over an open pit area of 460 acres, including the old UCC ISL leach area of (Table 6.4):

**Table 6.4. 1983 Chevron Palangana historic resource.**

<b>Tons</b>	<b>Avg %eU3O8</b>	<b>Pounds U3O8</b>
3,229,000	0.125	8,073,000

This resource included the aforementioned UCC DEF factors and a density factor of 18 CF/T as determined from a review of additional core data. These historic resources are pre-NI 43-101 but are believed to be relevant and reliable. Until further review and due diligence these resources are placed into the CIM "inferred" resource category.

The price of uranium declined dramatically after 1981, and Chevron halted development of the property. Chevron began restoration of the old UCC wellfield and ISL facility in 1986. During the reclamation phase, Chevron accomplished groundwater restoration through ground water sweep, with the excess treated water disposed of on a 90-acre permitted irrigation field. After the irrigation permit expired in 1996, restoration activities were continued through reverse osmosis treatment and disposal of the reject into deep disposal well WDW-134 (Jacobi, Palangana report).

#### **6.1.6 General Atomics Corp. (Rio Grande Resources Inc.)**

In 1991, General Atomics acquired Palangana, as well as other uranium projects, from Chevron. A continuation of Palangana reclamation and restoration activities was conducted by Rio Grande Resources, a General Atomics subsidiary. Dismantling of the process plant, decommissioning of the waste water ponds, and well plugging began in May 1995 and was completed in January 1996 (Jacobi, Palangana report).



In July 1995, the Texas Natural Resources Conservation Commission (TNRCC) verified that groundwater had been restored to acceptable levels. In December 1995, the TNRCC notified Chevron that the permit for disposal well WDW-134 had been voluntarily revoked. In May 1999, the United States Nuclear Regulatory Commission (USNRC) concurred that all reclamation activities had been completed satisfactorily (Jacobi, Palangana report). General Atomics returned the properties to the lessors in the late 1990s.

### **6.1.7 Everest Lease Acquisitions**

As noted in 6.1.4 above, Everest contemplated acquisition of Palangana in 1980 but abandoned the initiative due to the prevailing low uranium price and perceived restoration liabilities. The recent resurgent uranium market renewed Everest's interest in the Palangana property, and they acquired the two leases in January 2005.

## **6.2 Hobson Plant**

(See Figure 6.1)

Construction of the Hobson plant followed Everest's acquisition of a uranium minerals lease from Tony Moczygemba on property located in Karnes County near Hobson, Texas, in 1977. The Hobson ISL processing facility was constructed in 1978 and commercial yellowcake production began in 1979. Uranium extraction from the nearby Moczygemba deposit continued into 1981; aquifer restoration was initiated in February 1982 and completed in 1985 (Stover report).

The long term benefit of the Hobson Project was the availability of an ion exchange resin processing plant capable of producing approximately +500,000 pounds of dried U<sub>3</sub>O<sub>8</sub> yellowcake per year located in the South Texas Uranium Belt. Everest leveraged their Hobson facility into later uranium projects, including Las Palmas (Hebbronville, Texas), Mt. Lucas (Live Oak County, Texas), and Tex-1 (Karnes County, Texas), through the implementation of the "satellite" facility concept. This production strategy minimized uranium production costs by development of ISL mines within economic haulage distance of the central Hobson plant. The remote (or satellite) locations contain only the wellfields, ion exchange resin adsorption vessels, and the wellfield wastewater disposal systems. The uranium loaded ion exchange resin was trucked to the central plant for further processing through uranium recovery, precipitation, drying and packaging.

In 1980, following completion of the Moczygemba ISL mine, and with limited financial resources, the decision was made to operate the next project, Las Palmas, 75 miles south of Hobson, as a satellite to the Hobson project rather than to relocate the processing plant. This economically driven choice proved to

be a benchmark decision that demonstrated the economic feasibility of long distance satellite operations for uranium ISL projects. The satellite or remote ion exchange/well field facilities previously had been introduced by Atlantic Richfield and U.S. Steel at the Clay West/Burns Ranch projects. However, these satellites were situated within two or three miles of the Central Processing Plant rather than the 75 miles that separated Las Palmas and Hobson.

As market conditions briefly improved during the mid-1980's and the productivity at Mt. Lucas exceeded expectations, the capacity and capabilities of the Hobson facilities were expanded and upgraded. A rotary vacuum drying system was added to reduce overall operating costs and to provide the flexibility to deliver product to any authorized conversion facility (i.e., two in the United States, one in Canada, two in Europe). In 1984, the Hobson plant was completely renovated to replace the original short-lived systems with higher quality, longer-lived systems. The concrete slab underlying the equipment was repaired, re-grouted, and sealed to provide a long term, durable surface. New elution tanks, better agitators for precipitation, and all new piping and electrical systems were installed. The rated capacity of the facility was increased from its original 250,000 lbs U3O8/year to 500,000 lbs U3O8/year. In 1986, the highly productive well fields at Mt Lucas provided feed stocks that pushed Hobson's annual production above 600,000 lbs U3O8.

Everest's Texas uranium projects resulted in output from the Hobson Central Processing Facility as given in Table 6.4 (Stover report).

**Table 6.5. Historic Hobson Plant Yellowcake Production.**

<b>Year</b>	<b>Pounds U3O8</b>
1979	6,825
1980	18,185
1981	142,576
1982	273,686
1983	298,011
1984	395,408
1985	492,281
1986	620,823
1987	471,862
1988 (estimated)	200,000

## **7.0 GEOLOGIC SETTING**

### **7.1 Regional Geology**

(See Figure 7.1)

South Texas geology is characterized by an arcuate belt of Tertiary fluvial clastic units deposited along the passive North American plate margin paralleling the Gulf Coast from the Mexican border to Louisiana. These sedimentary units are primarily of fluvial origin and were deposited by southeasterly flowing streams and rivers. The stratigraphic sequences consist of packages of permeable sandstone units separated by and interbedded with impermeable intervals of siltstone and mudstone. The key units of the region, which also constitute the South Texas Uranium Belt, are from oldest to youngest (Figure 7.2):

- The late Eocene Whitsett Formation: The Whitsett, a minor uranium-producing unit, is part of the Jackson Group and consists primarily of coastal barrier-bar, channel-fill and lagoonal deposits of fine- to medium-grained, tuffaceous, feldspathic sandstones. The Jackson Group grades southeasterly into a barrier-bar complex.

- The Oligocene Catahoula Formation: The Catahoula, a major uranium-producing unit, is separated from the underlying Whitsett by the Oligocene Frio Clay. It consists of a series of highly tuffaceous, fluvial, channel-fill and crevasse splay sandstones accompanied by flood plain and lacustrine muds. They are thought to represent a volcanic sedimentary source in Trans-Pecos Texas or northern Mexico. The Catahoula grades down-dip into a deltaic and barrier-bar complex.

- The Miocene Oakville Sandstone: The Oakville, also a major uranium-producing unit, unconformably overlies the Catahoula Formation and consists of medium- to coarse-grained channel deposits of calcilithic fluvial sand, gravel, and mud, grading laterally into fine- to medium-grained sheet-splay sands. The coarser deposits are at the base of the unit. Interfluvial floodplain and playa muds and silts bound this unit. The Oakville was deposited in response to uplift along the Balcones Fault Zone. Cretaceous limestones and volcanic material from west Texas are the principal source rocks. Down-dip, these sediments grade into strike-oriented barrier-bar sandstones.

- The Miocene Fleming Formation: The Fleming conformably overlies the Oakville and is generally similar except for a greater proportion of mud. It contains only minor uranium mineralization.

- The Pliocene Goliad Formation, host for the Palangana and other uranium deposits, unconformably overlies the Fleming and is composed of three units: a basal fine- to coarse-grained to conglomeratic cross-bedded unit with calcareous clay; a middle member of calcareous clay; and an upper unit of

sandstone and calcareous clay. Caliche is common, especially in the muddy sediments. The conglomerates contain a variety of lithic fragments from the Fleming and older formations. The Goliad is interpreted to be a braided meander belt fluvial deposit with muds as flood plain or overbank deposits. The sands, and gravels, composed mostly of quartz and chert, are very clean and associated with channels and point bars.

Passive margin growth faulting along the South Texas Uranium Belt is common with “down-to-the-coast” normal faults predominating.

## **7.2 Local and Property Geology**

(See Figures 7.3 and 7.4)

The local and property geology at Palangana is characterized by the occurrence of a Gulf Coast piercement salt dome. This dome is approximately two miles in diameter and is overlain by Pliocene sediments of the Goliad Formation. The Palangana dome is marked at the surface by a shallow circular basin surrounded by low hills rising 50 to 80 feet above the basin floor, and hence its Spanish name, Palangana, which translates to “washbasin” in English (Steinhauser, S. R., An Occurrence of Uranium at the Palangana Salt Dome, Duval County, Texas, USAEC DAO-5-Tm-1, March 1957).

The Palangana dome has an almost perfectly circular salt core with a remarkably flat top that is approximately 10,000 feet across and occurs from 800 to 850 feet below the topographic surface. The rocks covering the dome are essentially flat lying, but data from historic oil well drilling indicate that the beds dip from 30 to 58 degrees at depths of 3,500 to 4,200 feet. The dome’s caprock consists of a 400 foot thick sequence of anhydrite with some gypsum and calcareous material. No structural details of the lateral beds around the salt core have been worked out as currently known from the available information.

The stratigraphy of the Palangana deposit consists of the Goliad Formation, with drill information primarily limited to depths of 400 to 500 feet that bottom in Goliad sandstones and mudstones (Figure 7.5). The Goliad at Palangana is composed of fine- to medium-grained, often silty, channel sands interbedded with lenses of mudstone and siltstone. For the most part, the sand is very sparsely cemented although it varies from friable to indurated. A generalized lithologic section from youngest to oldest consists of a) 20 to 30 feet of sand, clay and caliche, b) 160 to 200 feet of red-brown sandy clay with occasional sand lenses, c) a 10 to 20 foot blue-gray clay marker bed (marine?), d) a 80 to 100 foot thick sequence of sandstones and claystones that mark the uranium mineralized horizon, and e) a blue-green clay horizon that extends to the anhydrite cap.

There is little known faulting in the area, although numerous minor faults and fracture patterns undoubtedly cut the area. The Palangana stratigraphy is horizontal to sub-horizontal, with at most a 2-3 degree southeasterly dip.

## **8.0 DEPOSIT TYPE**

(See Figure 8.1)

Uranium mineralization in the South Texas Uranium Belt occurs as sandstone-hosted roll front deposits. The deposits are strata-bound, elongate, and often, but not necessarily, occur in the classic "C" or truncated "C" roll configuration. They can be associated with an oxidation front or can be found in a re-reduced condition where an overprint of later reduction from hydrogen sulfide or other hydrocarbon reductant has seeped along faults and fractures. The uranium-bearing sandstone units can themselves be separated into several horizons by discontinuous mudstone units, and separate roll fronts and sub-rolls can occur in the stacked sandstone sequences.

The generally accepted origin of uranium mineralization in the Goliad Formation is from leaching of intraformational tuffaceous material or erosion of older uranium-bearing strata. The leached uranium was carried by oxygenated ground water in a hexavalent state and deposited where a suitable reductant was encountered. The oxidation/reduction (redox) fronts are often continuous for miles, although ore grade uranium mineralization is not nearly as continuous. The discontinuous nature of uranium mineralization is often characterized as "beads on a string" and is due to sinuous vertical and lateral fluvial facies changes in the permeable sandstone host horizons, coupled with ground water movements and the presence or absence of reducing material.

## **9.0 MINERALIZATION**

(Refer to Figures 9.1 through 9.4)

Palangana is a multiple-stage roll front-type deposit that is wrapped around the top of the Palangana Dome in a roughly "horseshoe shaped" configuration. As uranium-bearing ground water moved from west to east through the region, a redox front was created around a subsurface high of reduced rock on top of the dome. This reduced ground resulted from the introduction of hydrocarbons or their derivatives, mainly hydrogen disulfide ( $H_2S$ ), into the Goliad aquifers through fractures and formational seepage above the dome, providing a reducing environment for uranium precipitation.

The Palangana uranium mineralization occurs in the Goliad sandstone unit at depths ranging from 250-400 feet. The favorable sandstone unit is as much as 100 feet thick and is bounded by mudstones. Within this unit are at least six separate sandstone horizons hosting roll-type uranium mineralization.

These units are interbedded with mudstones that served as constraining aquitards for uraniferous groundwater movement.

Mineralization occurs as uraninite and is fixed at positions where the migrating uranium-bearing solutions encountered a suitable oxidant. Uranium values in mineralized strata grades from 0.00X %eU<sub>3</sub>O<sub>8</sub> to several percent eU<sub>3</sub>O<sub>8</sub>. Mineralized thicknesses range from less than one foot to several tens of feet.

Molybdenum is a significant accessory to uranium mineralization, with an erratic distribution. Select core assay reports were reviewed, with assays ranging from a background of approximately 50 ppm to as high as 0.23% Mo. More typically, assays range from 0.02% to 0.04% where molybdenum levels are elevated. It was often but not always in direct association with uranium grade (high Mo with high U<sub>3</sub>O<sub>8</sub>); often occurred within a mineralized zone but with the higher Mo grades associated with weaker mineralization of that zone; often occurred above or below uranium intercepts in weak uranium mineralization; or simply as an anomaly unassociated with uranium, probably ahead of the primary ore zone as is typical of other deposits. The molybdenum mineral is likely jordisite, a molybdenum sulfide, since high molybdenum was associated with elevated sulfur, but no documentation of mineralogical analyses were available. Molybdenum was not noted as a problem in the UCC leach stream and Everest has not noted molybdenum as a contaminant in their other Texas operations (Everest personal communication, Clark, 2005).

Although there were few selenium assays available, it was also often elevated in the mineralized zones, its grade generally following uranium grades. It does not appear to have a relationship to molybdenum. The highest value observed in core analyses was 0.09% Se associated with a chemical U<sub>3</sub>O<sub>8</sub> grade of 1.8%; Se grades of 0.01% to 0.03% in the mineralized zones were the most common. Background values were generally less than 10 ppm.

Vanadium is not common in the south Texas deposits and the few V<sub>2</sub>O<sub>5</sub> assays available did not show an elevation in mineralized zones over background values of 0.01%-0.03% (personal communication, Oman, 2005).

There has been historic brine, sulfur and oil production from the dome on the leased properties; brine was being produced as late as 1957. These old wells have had no influence on uranium operations.

## **10.0 EXPLORATION**

Neither the author nor Standard Uranium personnel have conducted any exploration work on the Palangana property. Instead, efforts to date have been confined to review of available data and critical evaluation.

## **11.0 DRILLING/SAMPLING/ANALYSIS/SECURITY**

### **11.1 General Discussion**

(Refer to Figures 11.1 and 11.2)

Exploration for roll-type uranium deposits relies almost entirely on drill testing, since no surface geophysical or geochemical methods can adequately delineate even shallow subsurface uranium mineralization. The Palangana deposit, with uranium mineralization occurring at depths of 250 to 400 feet, was drill tested with a total of over 1,280 rotary and core holes by UCC and Chevron (as is currently known from historic reports and records). This total does not include more than 3,000 production holes and monitor wells drilled by UCC in the ISL wellfield area from 1977 to 1979, for which many records have not been located. Many records from the early stage exploration drilling by CRI have also been lost over the last fifty years or so. These lost records do not impact the resource estimated for this report. Notwithstanding, from initial review of the scope and quality of work performed by UCC and Chevron, it is clear that both companies met or exceeded exploration best practices in place at the time.

### **11.2 Rotary Drilling and Logging**

#### **11.2.1 Standard Practices**

In general, common roll-front exploration practice was to drill widely-spaced rotary holes on a 400 to 1000 foot or greater grid pattern, examine cuttings for evidence of alteration-bleaching-oxidation, gamma logs for evidence of uranium mineralization, and resistivity/self-potential logs for evidence of permeable sandstone horizons. The drill spacing was tightened further between areas of reduced and oxidized sandstone host horizons to target the uranium enriched redox boundary. Once the roll front mineralization was intersected and its trend established, fences were drilled every 200 feet with holes within fences further tightened as required by the lateral continuity of the uranium mineralization.

The UCC and Chevron rotary holes were drilled to pre-targeted depths with truck-mounted mud rigs capable of drill depths up to 1,500 feet. The holes were generally drilled to a 5-1/8-inch diameter and used a drilling fluid consisting of a polymer mud with various additives for fluid loss control. The drill orientation was vertical, and given the shallow depth of drilling (i.e., less than 400 feet) in relatively soft sedimentary units, there was minimal hole drift or deviation. As a result, it is reasonable to assume that the holes intersected the horizontal to subhorizontal lenses of uranium mineralization at approximately a normal angle. Rotary cuttings were examined in the field and log data recorded.

Upon completion of a drill hole, it was logged with gamma ray, self-potential, resistivity and continuous drift by either an in-house logging truck or contract unit (see further discussion below). Drill hole collar locations were surveyed and recorded.

### **11.2.2 UCC Rotary Drilling**

UCC drilling appears to have followed standard practice, but somewhat inconsistently. The result is that the 1,117 holes are unevenly distributed over the project area. The focus of the UCC drilling was within a 3,500- by 3,400-foot area surrounding the UCC ISL wellfield, an 800- by 1,700-foot area on the southwest flank of the Palangana Dome depression. The remainder of the UCC drilling appears to have targeted mineralization around the periphery of the depression, as well as topographic highs in the center of the depression. The resulting drilling appears somewhat scattered, often occurring in clusters of 100- to 200-foot centered patterns surrounding +0.50 GT holes. There are isolated +0.50 GT holes in a number of locations on the property, some with no other hole within hundreds of feet. These occurrences present excellent follow-up exploration opportunities.

### **11.2.3 Chevron Rotary Drilling**

Chevron's drill program was limited, totaling just 163 holes, but followed a much more consistent and methodical drilling strategy. Their exploration drilling focused on filling in areas of sparse UCC drilling west and northwest of the ISL wellfield. This region corresponds to much of the western margin of the salt dome depression. The resulting pattern stepping west from the ISL wellfield yielded a fairly regular delineation drill grid on nominal 100 foot centers. To the northwest, Chevron's drilling was clearly for exploration and not delineation, resulting in a nominal 200 foot grid pattern.

## **11.3 Core Drilling, Sampling, and Assaying**

### **11.3.1 Standard Practices**

Core was typically 2-3/4-inches in diameter, and was boxed, split, and logged with particular attention to alteration, oxidation, lithology, and mineralization. A hand-held Geiger counter or scintillometer was used to define mineralized boundaries and the interval to be sent to the assay lab. One-half the core was bagged for assay and the other half stored for later reference. None of the original physical core is available today. All coring was done by UCC as far as could be determined at the present time.

Core holes are typically sited adjacent ("twinned") to uranium mineralized rotary holes to provide samples for chemical assay analysis as a QA/QC check against the gamma log eU3O8 values. This was not the case with UCC core



drilling at Palangana. Instead, core drilling was simply inserted within the overall drill pattern of rotary holes. While this non-standard approach eliminated an important QA/QC check on the rotary eU3O8 gamma log derived grades, the core material was still subjected to radiometric versus chemical assay analysis at the laboratory.

At a minimum, two assays were typically run: a percent chemical U3O8 by one of several acceptable methods and an equivalent percent U3O8 based on a "closed can" radiometric assay to determine a gamma equivalent assay to approximate the downhole gamma log. Although it was standard practice to insert QA control samples (i.e., blanks, standards, and duplicates) into the sample sequence, there are no records from the UCC sampling to verify that a QA/QC procedure was followed.

### **11.3.2 UCC Core Drilling**

There were 296 core holes completed by UCC on the Palangana property. Assaying for these holes was conducted either at UCC's in-house laboratories in Grand Junction or Rifle, Colorado, and at independent Core Laboratories Inc. located in Corpus Christi, Texas. Thirty-three of the core holes were examined in detail. Core recovery was generally between 80% and 100%. Where the loss occurred in the mineralized interval, which unfortunately happened regularly, it rendered that interval useless for disequilibrium comparison (see discussion below) with the downhole gamma log results.

Cores were run from the top of the mineralized sand to the projected bottom of the sand, some 70-90 feet per hole. Cores were sampled on irregular intervals, but never more than one-foot per sample, based on mineralized zones from the gamma log and scintillometer readings. Core descriptions and a graphical representation of the core hole were also included in the core hole files.

Assay sheets report "chemical" U3O8 (probably by fluorimetric method) and closed can (Core Laboratories) or radio assay (UCC labs). Most samples were also run for Mo, Se, total S, total Fe,  $\text{Fe}^{+2}$ ,  $\text{Fe}^{+3}$ , and a few assays for  $\text{V}_2\text{O}_5$  and As were also noted. In addition, Core Laboratories Inc. ran select samples for horizontal and vertical permeability and porosity from core plugs and density measurements.

Horizontal permeability values ranged from practically zero to over eight darcies. The lower values corresponded to mudstones and some very fine-grained zones described as "silty" and/or "limy." Within mineralized zones, horizontal permeability varies from a few hundred millidarcies to the upper limit of over eight darcies. Sample descriptions between the two extremes are hardly different – both are most often described as very fine-grained to fine-grained, silty sandstone. Absent any analytical data and more detailed descriptions, the conclusion is that the lower permeability samples are due to more clay or calcium

carbonate cement. Vertical permeability ranged from 50% to 75% of horizontal. Porosity percentages from core plugs ranged from the low 20s to the low 30s with an average of about 28% in the core descriptions examined.

Core plugs of a few centimeters, basically a point source, are not a particularly reliable method of determining permeability over an ore zone that covers many feet. Pump tests are recognized as a reliable method from an ISL technical standpoint and are required for regulatory purposes. No pump test data was available although they undoubtedly were conducted for permitting purposes.

UCC settled on a density factor of 17 CF/T for rock density. An average of 137 density values available for 15 cores studied averaged 16.8.

### **11.3.3 Chevron Core Drilling**

From the available reports and records reviewed, there is no evidence that Chevron conducted core drilling on the Palangana property.

## **11.4 Down-hole Logging and Gamma Probe Calibration**

### **11.4.1 Standard Practice**

Both rotary and core drill holes were down-hole logged after completion with gamma ray, self-potential, and resistivity by either an in-house logging truck or contract unit (see further discussion below). The gamma log was obtained by lowering the gamma probe down the uncased drill hole after the drill string was removed. The gamma ray probe, resistivity, and self-potential probes were packaged in the same probe string. A very accurate counting wheel measured the speed and depth of the probe as it was withdrawn from the hole.

When a mineralized interval is encountered, the probe is pulled up through the zone to find its upper limit, lowered again and the mineralized zone is re-run at a less-sensitive scale to fit the plot on the gamma log paper. In addition to the gamma curve, plots are made of the resistivity and self-potential (SP). The resistivity and SP provide a continuous strip chart of the various lithologies as the probe is lifted up the drill hole. Thus, the gamma anomalies can be correlated to a specific footage and correlated with specific lithologic units, much as in core.

The basis of the grade calculation is the area under the gamma curve, the characteristics of the sodium iodide crystal in each individual probe and the hole diameter (see below). Each probe's characteristics must be determined individually using known uranium standards.

The "K Factor" is a factor determined for each radiometric logging apparatus in order to standardize equivalent assays (eU3O8). Each logging unit,

probe etc. must be individually calibrated to determine its own K Factor. K Factors can be determined from specially designed calibration pits, reference sources or cored holes. Dead Time is a function of the probe as well and corrects for saturation of the detector in high-grade zones. The water factor compensates for attenuation of gamma rays passing through fluid in the drill hole.

Gamma log calibration pits were constructed by the AEC at George West, Texas, for the South Texas Uranium Belt (Personal communication, Oman, 2005). Logging trucks were calibrated regularly, typically on a monthly basis. K-factors, dead time and water factors were derived. Once these values are known, they can be used to calculate eU3O8 grades. A hole-by-hole record of K-factors, dead time and water factors for UCC and Chevron Palangana drilling is available in the records, indicating there were regular quality control calibration runs for the respective drilling programs.

#### **11.4.2 UCC Down-Hole Logging**

UCC used a combination of their own logging trucks as well as those of independent contractor Century Geophysical Corp. Each hole has a gamma log record that consists of a header sheet with the date, hole number, truck number, probe number, rerun factors, water factor, crystal size, and K-factor. The down-hole logs consist of gamma-ray, resistivity, and self-potential curves plotted by depth. As previously noted, the resistivity and self-potential curves provided lithologic boundaries and were mainly used for correlation of sandstone units and mineralized zones between drill holes.

UCC's gamma log calculations are well documented with calculation sheets accompanying each log. The eU3O8 % grade from the gamma logs was calculated using the then industry-standard method developed originally by the AEC (Hallenburg and West). The method consists of the following procedure:

1. Pick bed boundaries at  $\frac{1}{2}$  the distance to peak counting rate.
2. Read counting rates at half-foot intervals and record, continue tabulation to include the next bed boundary.
3. Correct each count rate for dead time.
4. Apply the tail factor by multiplying the first and last value by 1.38.
5. Obtain area under the gamma curve by adding all tabulated values.
6. Multiply the resulting area by the water factor to obtain the true area under the gamma curve.
7. Multiply the true area by the K factor to obtain the GT (grade times thickness) product.
8. Divide the GT by thickness to obtain eU3O8 grade in percent.
9. If disequilibrium is known, it may be used to correct the value of grade.

It is now recognized that this method results in a conservative thickness since it ignores lower grade uranium material below the ½-height that is, in reality mineralized with U3O8. In addition, UCC often ignored the lower grade “shoulders” at the top and bottom of complex, multiple peak mineralized intercepts, thereby further reducing thickness of the anomalous interval. Further, the strict application of ½-height cutoffs also precluded including lower grade material internal to multiple peak intercepts. The net effect is that UCC underestimated intercept thickness and overestimated eU3O8 grade.

#### **11.4.3 Chevron Down-Hole Logging**

Chevron exclusively used the contract services of Century Geophysical Corp for down-hole logging. Logging technologies had advanced considerably from the 1980 time frame of UCC drilling. As a result, Chevron logged all of their holes using two techniques: Princeton Gamma Tech (PGT) and CompuLog. The (PGT) probe measured U3O8 directly – making it equilibrium corrected. The PGT probe was a precursor to the later more sophisticated, accurate, faster, less expensive and less complex neutron activation probes of today. The Century CompuLog system calculated uranium thickness and grade intervals automatically from the down-hole gamma log at various cutoffs and graphically recorded the gamma grades at the bottom of the log. The downhole data was also made available in digital format.

#### **11.4.4 Discussion of Disequilibrium Factor**

Disequilibrium is a term for the disparity in the normal ratio between uranium and its naturally occurring radioactive daughter products that are measured by the gamma log. Once deposited, it takes approximately one million years for uranium to form its radioactive daughter products and achieve equilibrium. The Palangana deposit has been characterized as a “young” deposit that has yet to reach equilibrium (Oman, Palangana report). In such deposits, the radioactivity level is lower than would be expected and actual uranium grade higher than indicated by the gamma log. In the oxidized zone, however, the opposite might be the case; uranium has been removed, leaving radioactive daughter products behind and a higher grade interpretation from the gamma log than actual in-place uranium content.

Disequilibrium studies are an integral part of every uranium resource drilling program and are based on core sampling and a comparison of chemical assays of U3O8 vs. gamma log eU3O8 values. The practical application is to compare the down-hole thickness and grade as calculated from the gamma-ray log to the thickness and grade as determined by chemical assay. Completed over a statistically and geologically significant number of mineralized intervals (low grade, high grade, near the roll front, behind the roll front and on the roll front, for example), a correction factor to grade can be established.

In well established areas, especially where mining has already progressed or where the deposit is thought to be an extension of an existing orebody, disequilibrium studies may take the form of only a few check cores as twinned holes every few hundred feet along strike. Early in the exploration program, companies may take up to 10% core. It appears that UCC cored nearly 10% of all their holes, unfortunately, not as twins to known mineralized holes.

The disequilibrium factor from the closed can assay and chemical, if such assays are available, is expressed as a ratio of chemical-to-radiometric (for example:1.5:1 chemical over radiometric) and can be used as a guide.

An overall factor for disequilibrium should be compiled for each deposit and adjusted as additional information is obtained. Such factors are recognized and accepted in the industry. Disequilibrium problems may be overcome through the use of direct measuring methods such as neutron activation or prompt-fission neutron logging tools (see below). Such use, however, does not obviate the need for data validation through chemical assays.

UCC's assays of chemical and closed can for the first 402 core holes drilled by UCC are recorded and analyzed (UCC internal document). The calculated DEF reported is 1.65 cU3O8/eU3O8 for cU3O8 values above 0.05% eU3O8 with a standard deviation of 0.51. An internal 1979 UCC resource estimate (referred to in the Historical Resource section above) reports a DEF of 1.17 used for that resource. Considerably more data and more geological experience with the deposit contributed to this adjusted figure.

It is concluded that there is a significant disequilibrium factor that must be applied to the Palangana resource. Its magnitude, however, is not determinable given the data available due primarily to core loss and UCC's practice of siting core holes within the regular drill pattern instead of as twins to plug holes with significant mineralization. The latter practice reduced the number of cores with significant mineralization for comparison with gamma logs.

## **11.5 Comments on Drilling Results**

(See Figure 11.3)

UCC and Chevron confined the great majority of their drilling to less than 200 acres comprising their wellfield and the immediate vicinity. A focus on production issues discouraged UCC from an aggressive exploration and delineation program. Chevron's focus was on filling in gaps in the UCC drilling necessary to evaluate the deposits for their open pit scenario. Significant mineralized intercepts were encountered outside of the production wellfield vicinity, but there was limited exploration follow-up. For example, a 6.78 GT hole drilled in Map Quad D-6 was never offset, with the nearest hole approximately

800 feet away. UCC's drill results suggest that the Palangana property has significant upside exploration potential.

Of the 1,280 UCC and Chevron holes and logs, 250 or 22%, were classified as holes with significant uranium mineralization (i.e., 0.50 GT or greater). The best GT intercept recorded was 6.78 foot-eU3O8% (14 feet grading 0.48% eU3O8). The thickest mineralized intercept was 39 feet and the highest grade 4.11% eU3O8. The Palangana property hosts a significant uranium deposit that is one of the larger of the undeveloped deposits remaining in south Texas.

## **11.6 Comments On Sample Security**

All drilling conducted on the Palangana property is historic in nature, and predates implementation of NI 43-101 sample security guidelines and requirements. Onsite collection and conversion of down hole gamma data limits the possibility of sample contamination or tampering. Further, the fact that the property has been drilled by many different companies over time independently verifying the tenor and style of uranium mineralization, and that the property saw limited ISL production points to the veracity of the historic drill data.

## **12.0 DATA VERIFICATION**

A review was made of extensive Everest's project files at their office in Corpus Christi, Texas. There were 15 file cabinets plus numerous boxes and map files covering the Palangana property and Hobson plant. Nearly all of this information resulted from the work of UCC, Chevron, and Everest. The files include gamma ray logs, eU3O8 calculation sheets, maps, reports, memos, and miscellaneous documentation. Everest has prepared an index of data in the file cabinets, but the information remains somewhat disorganized. It is estimated that it would take up to a year to thoroughly review, verify, and convert relevant information into a digital format for compilation, integration, and analysis. This effort is beyond the scope of the study.

As a result, specific items key to this report were selected, reviewed, cross-checked and verified. These items included representative down-hole logs, core data, log calculation sheets, assay data, mineral resource maps and calculations, mine production records, land records, environmental and various Everest, UCC and Chevron summary reports and geologic and engineering studies.

Approximately 50 representative gamma log calculations were checked and found to be mathematically and internally correct as determined by the ½-height method. From this review, as has already been noted, it was apparent that UCC underestimated the thickness of uranium mineralized intercepts that

would be exploited in an in-situ wellfield with a commensurate overestimation of grade. Whether these are offsetting is not clear, but from observation, it appears likely an increased GT would result. No correction or recalculation was made, and the author is confident that the UCC gamma log eU3O8 radiometric assays result in a conservative assessment of the uranium resource.

As far as could be determined, the factual down-hole uranium assay data from the Palangana exploration programs are reliably represented by the continuous gamma-logs from the various drilling programs.

These logs were run by in-house and independent contract logging companies. The procedure followed was standard to uranium industry practice and all required correction factors were recorded on the headings of the logs reviewed.

There was no data on probe truck calibration at test pits, although Century Geophysical operators were required by its company to run these pits regularly. UCC maintained a list of K-factors and water factors on a hole-by-hole basis, indicating they had run the calibration test pits regularly. The calibration of probes with the USAEC (later, Department of Energy) test pit is the standard with which the uranium industry operates. This method is analogous to a system of check assays of an assay laboratory. The test pits are designed with uranium-bearing material of the type and grade common to the area. Many thousands of drill hole intercepts in the South Texas Uranium Belt were logged in this manner with data leading to successful mines.

The author did not attempt to verify any of the sample data presented in this report by collecting samples as no further subsurface samples are available at this time and additional subsurface sampling is beyond the scope of this report. The author considers the assay results presented to be reliable.

### **13.0 ADJACENT PROPERTIES**

To the author's knowledge, there are no adjacent properties that have been explored or mined for uranium. This does not suggest that there is not significant potential on adjacent properties, as there are "hundreds" of uranium occurrences and prospects hosted in the Goliad, Catahoula and Oakville Formations of the South Texas Uranium Belt. Frequently, a lack of exploration or development work results from land tenure impediments as opposed to geologically based exploration potential.

### **14.0 MINERAL PROCESSING AND METALLURGICAL TESTING**

#### **14.1 Overview of ISL Uranium Mining**

(Much material in this section sourced from Wyoming Mining Assoc.)



In-situ leaching of uranium is a noninvasive, cost-effective mining process that minimizes the environmental impact of ore extraction. ISL technology was first demonstrated by Atlantic Richfield Co. at its Clay West Project near George West, Texas. Since that time it has been developed into the preferred technology for uranium extraction from sandstone-hosted roll-front-type ores. Essentially, the process extracts uranium from porous sandstone aquifers by reversing the natural processes which deposited the uranium. The sandstone aquifers provide the "plumbing system" for both the original emplacement of ore and the recovery of the uranium. The uranium was emplaced by weakly oxidizing ground water that moved through the plumbing systems of the geologic formation.

Figure 14.1 is a schematic view of a uranium roll front wellfield configuration. The red area is the uranium mineralization deposited at the interface between the oxidized (up gradient) sand shown in yellow and the reduced (down gradient) sand shown in gray. The up gradient sand has been altered by oxidizing groundwater that carried the uranium that was deposited in the roll front at the oxidation/reduction (Redox) interface. The uranium mineralization is hydrologically confined by an upper and lower confining layer of shale or mudstone. A production (pumping) well has been completed in the center of the roll front and is fed lixiviant (leach solutions) by two injection wells on each side of the front.

Detailed mapping techniques from downhole logging tools have been developed to define the geologic controls of the original solutions, so that these same routes can be retraced for effective in-situ leaching of the ore. Once the geometry of the ore bodies is known, the locations of injection and recovery wells are planned to effectively contact the uranium.

Following installation of the well field, the lixiviant, consisting of native ground water containing dissolved oxygen and carbon dioxide, is delivered to the uranium-bearing zone through the injection wells. Once in contact with the mineralization, the lixiviant oxidizes the uranium minerals, allowing uranium to dissolve in the ground water. Production wells, located between the injection wells, intercept the pregnant lixiviant and pump it to the surface.

## **14.2 Overview of ISL Uranium Processing**

A centralized or satellite ion exchange facility extracts the uranium from the pregnant lixiviant. (Ion exchange is a reversible chemical reaction wherein a charged ion, an atom or molecule that has lost or gained an electron and thus acquired an electrical charge, in solution is exchanged for a similarly charged ion attached to an immobile solid particle, in this case, a synthetic organic resin). The barren lixiviant, now stripped of uranium, is regenerated with oxygen and carbon dioxide and recirculated for continued leaching.



The ion exchange resin, now "loaded" with uranium, is then stripped of uranium or eluted (if a satellite operation is in progress the loaded resin is trucked to the central processing facility, otherwise the loaded resin is eluted in place). Once eluted, the ion exchange resin is ready again for loading of uranium at the central plant or at a satellite wellfield facility (if a satellite operation, the eluted and regenerated resin is trucked back to the satellite facility). The rich eluate is precipitated to produce a yellowcake slurry, the slurry is dewatered and dried to a final drummed yellowcake uranium concentrate (see Figure 14.2).

During the mining process, slightly more water is produced from the ore-bearing formation than is reinjected. This net withdrawal, or "bleed", produces a cone of depression in the mining area, controlling fluid flow and confining it to the mining zone. The mined aquifer is surrounded, both laterally and above and below, by monitor wells that are frequently sampled to ensure that all mining fluids are retained within the mining zone. The "bleed" also provides a chemical bleed on the aquifer to limit the buildup of species like sulfate and chloride that are affected by the leaching process. The "bleed" water is treated for removal of uranium and radium through reverse osmosis (RO) and can be used for permitted surface irrigation. The RO reject is sent to a waste disposal well (WDW).

### **14.3 Overview of ISL Uranium Restoration**

At the conclusion of the leaching process in a well field area, the same injection and production wells and surface facilities are used for restoration of the affected ground water. Ground water restoration is accomplished concurrently by "Ground Water Sweep" and reinjection of purified water. In the ground water sweep process, the wellfield is pumped (without any injection of oxygen or carbonate) and native ground water flows in to replace the removed contaminated water. Concurrently, the water removed from the wellfield is treated by RO and the purified water is reinjected into the wellfield. The reject is sent to the WDW. This reinjection of very pure water results in a large increment of water quality improvement in a short time period. Ground water restoration is continued until the affected water is returned to baseline or other required limits.

Deep disposal wells are in standard use at ISL operations. Typically a high permeability formation at depths of 4,000 feet or greater without oil or gas production or reserves is chosen. The well is cased and an injection system installed. Surface injection pressures are set below the fracture gradient of the injection interval.

Reverse osmosis uses a membrane that is semi-permeable, allowing the fluid that is being purified to pass through it, while rejecting the contaminants that remain. The RO reject is typically discarded through a deep disposal well. The

aquifer restoration process is a proven and standardized system throughout the uranium ISL industry.

Following completion of aquifer restoration, stabilization and verification, wells are plugged and abandoned, well casings are cut below ground surface and the area is revegetated and returned to its pre-mining use.

#### **14.4 Palangana Deposit Characteristics Relevant to ISL**

Sandstone-hosted roll-front uranium deposits such as Palangana are especially amenable to ISL processing and mining. As noted by the CIM uranium sub-committee, ISL operations have specific geologic conditions and engineering requirements. These requirements and their relevance to the Palangana property are as follows.

1. Permeability: Permeability within mineralized zones at Palangana as determined from core analyses (see Section 11.3.2) ranges from a few hundred millidarcies to over eight darcies. Other ISL deposits with which the author is familiar are successfully operated at the lower limit of these levels. In addition, UCC, despite other production issues, successfully injected and extracted leach solutions during their ISL operations.
2. Hydrological Confinement: Core descriptions reviewed and the Steinhäuser report show that the upper boundary of the ore horizon is confined by a hard calcareous layer and a clay zone with a combined thickness of approximately 100 feet. The lower boundary is confined by at least 75 feet of clay followed by anhydrite of the salt dome cap.
3. Uranium Dissolution: There is no documentation regarding bench-scale or field testwork of the amenability of uranium mineralization at Palangana to dissolution by alkaline leach solutions. However, it would be highly unusual to begin a production operation without at least bench-scale testing. It is likely that such testing was done, and it is known that UCC operated push-pull field tests during the 1969-70 period with production of some 12,000 pounds U<sub>3</sub>O<sub>8</sub>. In any case, the UCC operations clearly demonstrated that uranium was leachable in an oxygenated carbonate solution.
4. Aquifer Restoration: The method of aquifer restoration used by UCC was ground water sweep and later, reverse osmosis with deep well injection of the reject. This method, basically the standard for modern day operations, was successful in restoring the aquifer to required levels and was accepted by the State of Texas.

In summary, all of the primary geologic and engineering parameters required for an ISL project are present at Palangana.

#### **14.5 Palangana Past Production and Analog Deposits**

As discussed in Section 6.1.3, the Palangana property was in ISL production from 1977 to 1979. It is assumed that UCC conducted significant test work leading up to, and during production, but historic records of this work are unavailable as is presently known.

It is intended that the Palangana property will operate as a satellite ISL facility to the Hobson Central Processing Facility. Wells will be drilled on a regular pattern into the orebody, cased and cemented. Mineralized zones will be selectively opened through underreaming or selective packing to prevent leakage of solutions into overlying and underlying formations. Oxygenated formation water containing bicarbonate will be injected into one set of wells (injection wells) and the solubilized uranium recovered from a set of production wells 50 to 100 feet away. Uranium in the produced solutions will be recovered in an ion exchange plant at Palangana using inorganic resin. Uranium will be stripped from the resin, precipitated, dried and packaged for transport at the Hobson facility (See Section 14.1).

The UCC production project, although poorly operated due to various factors, proved that the Goliad sandstone host has the required permeability for ISL operations, that the ore is leachable, that uranium in leach solutions can be recovered through an ion exchange process, and that aquifer restoration can be achieved.

As previously noted (Section 6.1.3) UCC did not operate the wellfields to final mine-out. Recovery is estimated at 318,000 or 340,000 pounds U<sub>3</sub>O<sub>8</sub> from an estimated resource of about 1,000,000 pounds, and therefore no absolute recovery factor for the Palangana property is available. Recoveries of the in-place resource are historically assumed by ISL operators in Texas, Wyoming and Nebraska to be 70%-80% of the in-place reserves. CIM quotes recovery is commonly 60%-70% and could be lower. However, personal communications with Cogema personnel, operators of the nearby Holiday-El Mesquite and O'Hern ISL operations, quoted recoveries of 85% to 90% of the "Measured" resource, with 100% recovery of the resource from the last wellfield at Holiday-El Mesquite. These projects are some 30 miles southwest of the Palangana property and in the Goliad Formation as well. A recovery factor of 80% or better is a reasonable assumption for the Palangana property.

UCC's primary problem was that it operated the ISL mine at high pH: 8 to 10 – resulting in solubilization and reprecipitation of calcite at the recovery well pumps from the reduced pressure there and in the formation as well. Many of

the pumps remain today firmly cemented in place. In addition, the push-pull system served to continually expand the lixiviant zone because it was impossible to draw all the solutions back before degradation of solution grade and another "push" was initiated, resulting in a loss of uranium resource that could not be recovered.

## **15.0 MINERAL RESOURCE ESTIMATE**

(see Figures 15.1 – 15.3)

The author estimated Palangana mineral resources to NI 43-101 requirements and standards. The author is experienced in roll front uranium deposit mineral resource estimation, and is an independent qualified person for the purpose of reporting 43-101 compliant mineral resources for the Palangana property. The resources were estimated based upon CIM best practices guidelines, as well as additional CIM guidelines specific to uranium projects.

This resource estimate is based upon both the UCC and Chevron drill information. Conversely, historic Palangana resource estimates by UCC, Chevron, and Everest did not use the combined data (i.e., UCC and Chevron). The resources were estimated using the GT outline method, a common estimation technique particularly well-suited for ISL uranium deposits (see CIM document). In general, the GT method uses the product of the eU<sub>3</sub>O<sub>8</sub>% grade multiplied by the true thickness (i.e., GT) for intercepts above cutoff within the mineralized horizon. This technique accommodates the unique aspect of in situ mining where the economically extractable U<sub>3</sub>O<sub>8</sub> cutoff is a combined function of a mineralized zone's grade and thickness.

A GT cutoff of 0.50 foot-eU<sub>3</sub>O<sub>8</sub>% was used for the Palangana estimate. This is a common cutoff used in the South Texas Uranium Belt and is appropriate for this preliminary assessment. The drill data used consisted of gamma ray logged eU<sub>3</sub>O<sub>8</sub>% grades that had a DEF of 1.17 applied to them in the case of UCC drilling, but were uncorrected in the Chevron case. Hence, the Chevron eU<sub>3</sub>O<sub>8</sub> grades are probably conservative.

UCC had prepared 26 separate 600:1 scale maps (i.e., 1 inch = 50 feet) on a grid system covering the entire mineralized area (i.e., extent of the Palangana Dome). Drill hole locations, hole number, depth to the mineralized intercepts and thickness and eU<sub>3</sub>O<sub>8</sub>% grade data were posted. These data were critically reviewed and a representative number compared with original log data for validation. From this review the UCC data is judged as reliable and relevant for this preliminary assessment. Thickness and grade data for the 163 Chevron holes was compiled from Chevron's Century logs in Everest's files. These data were posted to the maps based upon collar survey locations.

Uranium mineralized zones were correlated in plan using two criteria:

- Drill intercept grade cutoff of 0.02% eU3O8,
- Drill intercept GT cutoff of 0.50 foot-eU3O8%.

Meeting both of these criteria was required for a drill hole to be included in a given mineralized zone, and hence the resource. The historic UCC ISL wellfield was excluded from the estimation.

For drill intercepts meeting the grade and GT cutoffs, the following rules and procedures for correlating such intercepts into mineralized zones were applied:

- Zone boundaries projected one-half the distance to weakly mineralized (i.e.,  $\leq 0.10\%$  eU3O8) adjacent holes or 35 feet, whichever is less.
- Zone boundaries projected three-quarters of the distance to strongly mineralized (i.e.,  $>0.10\%$  eU3O8) adjacent holes or 60 feet, whichever is less, if no GT is posted. If a GT is posted, proportion distance on GT.
- For above GT cutoff holes with no adjacent hole within 200 feet, extrapolate zone boundary 60 feet.
- Within the 0.50 GT correlatable zone, maximum projection along strike of the roll front was 300 feet and generally no more than 200 feet; perpendicular to strike, the maximum projection was 200 feet but generally was 120 feet or less.

The 0.50 GT contour line was drawn around the selected correlatable intercepts. The resulting enclosed zone, or 'mineralized block', thus yielded an area that was calculated in units of square feet. Average weighted thickness and grade of 0.50 GT and above holes within the block was calculated and an average thickness and average grade determined. A bulk density of 17 CF/T was used.

The formula for mineralized block tonnage is given by:

$$\text{Tons} = \frac{\text{Area (square feet)} \times \text{Avg. Thickness (feet)}}{17 \text{ cubic feet/ton}}$$

The formula to calculate pounds of U3O8 is given by:

$$\text{Pounds U3O8} = \frac{\text{Tons} \times 2000 \text{ pounds/ton} \times \%eU3O8}{100}$$

Fifty-seven mineralized resource blocks were constructed, yielding a mineral resource estimate of:

**Table 15.1. Palangana 43-101 inferred resource.**

<b>Tons</b>	<b>Avg %eU3O8</b>	<b>Pounds U3O8</b>	<b>Avg Thickness (feet)</b>
1,906,000	0.150	5,701,000	8.6

The increase in resources over the Everest 1980 estimation is due to addition of the Chevron holes, which added materially to several resource blocks. A summary table of the ore blocks is included as Appendix 1.

The resource estimated meets the requirements of Inferred Mineral Resources under the CIM Standards on Mineral Resources And Reserves adopted in 2000. The definition states that “An ‘Inferred Mineral Resource’ is that part of a Mineral Resource for which quantity and grade or quality can be estimated on the basis of geological evidence and limited sampling and reasonably assumed, but not verified, geological and grade continuity. The estimate is based on limited information and sampling gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes.”

## **16.0 ADDITIONAL INFORMATION FOR PALANGANA - HOBSON PROJECT**

The Palangana-Hobson project is considered by the author as an advanced exploration project. Although the project has had past production and does include production facilities and equipment, there is considerable due diligence work remaining before advancement to the development level can be justified. The Hobson plant, however, is in a condition to be thoroughly evaluated and engineering estimates made for its upgrading and reconditioning. Additional data is provided below for solely informational purposes. Further analysis is beyond the scope of this study.

### **16.1 Mining Operations**

It is intended that the Palangana property will operate as a satellite ISL facility to the Hobson Central yellowcake processing facility. ISL mining and processing systems have been discussed in detail elsewhere in this document and will not be repeated here. The Palangana and Hobson operations are not expected to differ significantly from the general scenario discussed in Section 14.

### **16.2 Environmental And Permitting**

(much of the following taken from personal communication, Clark, 2005)

Texas is an “Agreement State,” meaning that it self-regulates permitting, monitoring and control of uranium mining, milling and processing activities. In general the project environmental requirements include:

#### Palangana

1. Prior to drilling activity an Exploration Permit is required from the Texas Railroad Commission, a largely administrative activity.
2. A Radioactive Materials License (RML) will be required as a sub-site to the base RML at Hobson.
3. The Base Mining Permit for the property will require reprocessing through the Texas Commission of Environmental Quality.
4. An EPA aquifer exemption for Palangana exists.
5. Production Area Authorizations are issued through the Texas Department of Environmental Quality. The original PAA for UCC was 1,500 acres and potentially can be revised. Otherwise a new permit is required. Various baseline studies, pump tests, etc. are required.
6. Archeological and ecological surveys are appended to the RML.
7. Work is completed for an Air Quality Permit, which is issued through the Texas Commission of Environmental Quality.
8. The waste disposal well will require restoration and a mechanical integrity test.

Before mining can begin, an area permit for wellfield installation and individual Production Area Authorizations (PAA) for each wellfield production area within the permit area is required – the original UCC PAA of 1,500 acres can potentially be revised. The area permit application usually includes the first few PAAs as part of the proposal for a permit. It is expected that the previous aquifer exemption from the Environmental Protection Agency remains effective. Various baseline studies will be required for the area permit application.

Groundwater restoration will be accomplished using ground water sweep, RO cleanup, clean water reinjection and deep well disposal as previously described.

#### Hobson

1. The Radioactive Materials License is in-place and active; requires notification of preparation for production to Texas Department of State Health Services.
2. WDW 168 is in temporary shut-in status and requires mechanical integrity test through Texas Commission Of Environmental Quality.
3. An Air Quality Permit is in place.

The waste disposal well at the Hobson plant will require restoration and a mechanical integrity test to bring it back to operation. The Radioactive Materials License for the Hobson plant is still active, as is the permit for the waste disposal well.



## 17.0 CONCLUSIONS

The objectives of this technical review for the Palangana-Hobson uranium ISL project have been met, resulting in the following conclusions:

1. Palangana is a property of merit that warrants additional work and investment, and
2. The Hobson yellowcake processing facility provides a current operating license and, with rehabilitation, the infrastructure necessary for yellowcake production.

The ISL amenable uranium resources at Palangana coupled with the Hobson processing facilities provides a foundation for Standard Uranium Inc. to fast-track advance the project to production status. The author is not aware of any land, environmental, mining, metallurgical, permitting, or regulatory issues that would adversely impact project advancement.

The Palangana deposit occurs in a permeable sandstone unit of the Goliad Formation and is a typical example of a South Texas Uranium Belt roll front deposit. These deposits in general, and Palangana specifically, are particularly favorable for ISL mine production. Title to the Palangana property is secure, and the Everest leases are in good standing.

The exploration and production drilling conducted by UCC and Chevron between 1958 and 1980 provided the basis for an updated 43-101 compliant resource estimate. Estimation was conducted using uranium industry standard estimation methodologies and resulted in an inferred resource of 1,906,000 tons at an average eU<sub>3</sub>O<sub>8</sub> grade of 0.150%, yielding 5,701,000 pounds of U<sub>3</sub>O<sub>8</sub>. This resource is in general agreement with the historic resource estimates of UCC, Chevron, and Everest. However, the current inferred resource was estimated using both the UCC and Chevron data in contrast to previous estimates that relied solely on UCC drill results.

UCC and Chevron followed industry standard exploration best practices guidelines in place at the time. Critical evaluation of the UCC and Chevron drilling results established that these data are reliable, but may report a conservative representation of the thickness and grade of uranium mineralization. The density of the historic drill data is sufficient to justify classifying some of the resource into the indicated and measured categories, and further due diligence review may justify reclassification. Uranium mineralization remains laterally open, and wildcat UCC exploration holes suggest that Palangana has significant upside exploration potential.

The cold-standby status of the Hobson processing plant will require facility and infrastructure rehabilitation, most notably to various pumps, the yellowcake

thickener, all electrical and instrumentation and control systems, and laboratory analytical equipment. Site cleanup will include disposal of old, obsolete and outdated equipment and supplies. There is a considerable amount of valuable equipment available for construction of a satellite plant, including ion exchange vessels, resin, pumps, piping and wellfield hoses (Stover report).

The nominal capacity of the Hobson facility is +500,000 pounds U3O8/year and an upgrade to one million pounds U3O8/year is justifiable. This upgrade can be affected with an updated resin handling system and installation of a new filter press and larger yellowcake dryer. The waste disposal well at Hobson is in good standing but requires clean-up and testing. Title to the Hobson site appears to be in good standing.

## 18.0 RECOMMENDATIONS AND BUDGET

Palangana-Hobson is a project of significant merit justifying additional work and investment as outlined below. The author is aware of the binding letter of intent (LOI) between Standard Uranium and Everest announced October 11, 2005. The following recommendations assume that the joint venture described in the LOI will be executed, and the work programs are designed on a go-forward basis. The recommended programs, divided into two six-month phases follow as Tables 18.1 and 18.2

**Table 18.1. Phase 1: Permitting, Environmental, and Drilling**

Texas financial security escrow	\$800,000
Hobson used equipment cleanup	\$100,000
Purchase gamma/PFN logging units, GPS, computers	\$512,000
Confirmatory and exploration drilling	\$1,000,000
Permitting, legal, baseline environmental studies	\$350,000
Legal services (environmental)	\$120,000
Additional property acquisition	\$100,000
General and administrative	\$500,000
<b>Total (USD)</b>	<b>\$3,482,000</b>

The second phase of work is contingent on successful completion of Phase I.

**Table 18.2. Phase 2: Development and Exploration Drilling, Permitting, Environmental.**

Hobson used equipment cleanup	\$100,000
Development and exploration drilling	\$1,000,000
Permitting, legal, baseline environmental studies	\$60,000
Additional property acquisition	\$100,000
General and administrative	\$500,000
<b>Total (USD)</b>	<b>\$1,760,000</b>

The recommended work programs outlined above would commence upon execution of the Standard Uranium-Everest JV in January, 2006.

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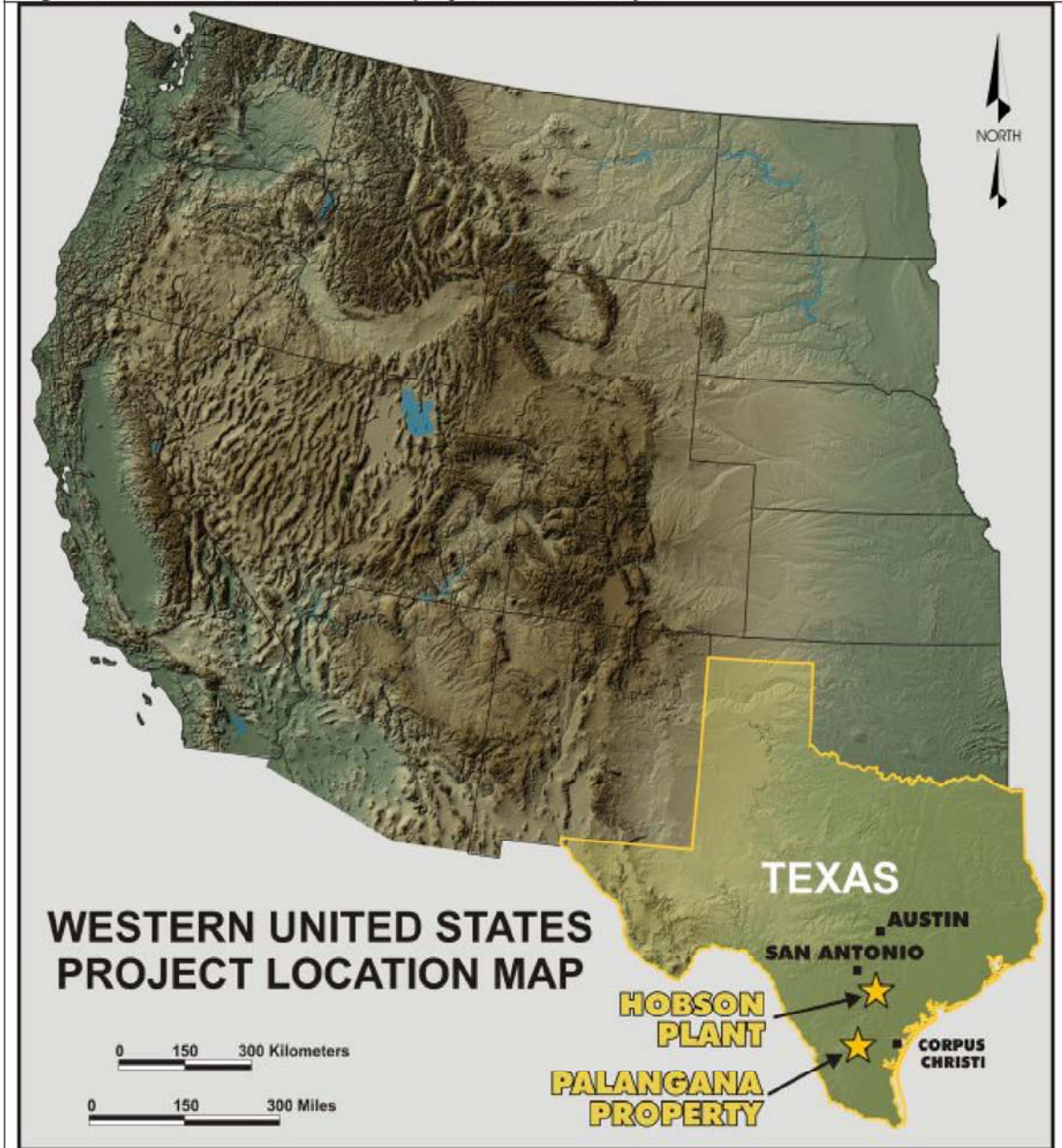
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West, Jerry, 1975, Uranium Logging Techniques, Logging Operator's Manual Sec. III-A, Century Geophysical Corp., Tulsa, OK.

Wyoming Mining Association. <http://www.wma-minelife.com> (accessed 2005), In-Situ Leaching.

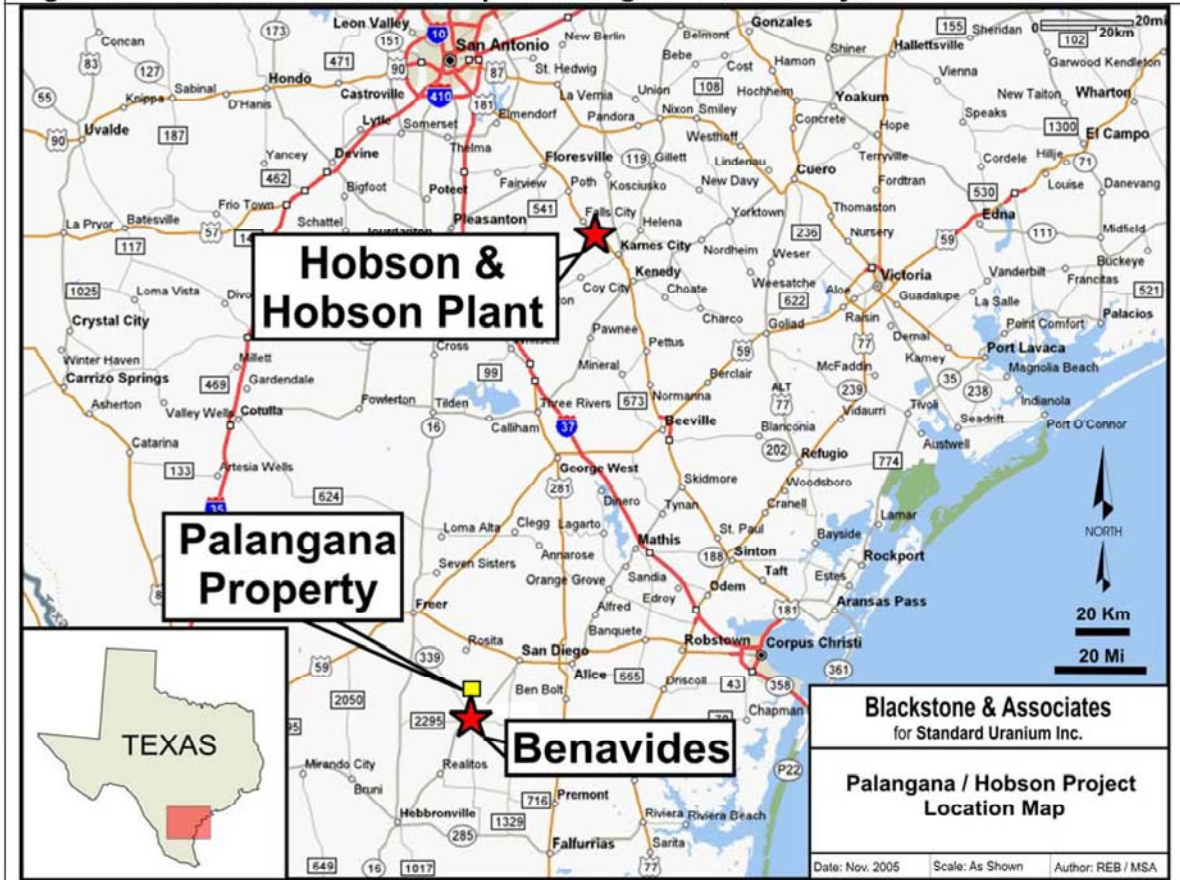
## **20.0 FIGURES**

Figure 2.1. Western United States project location map.



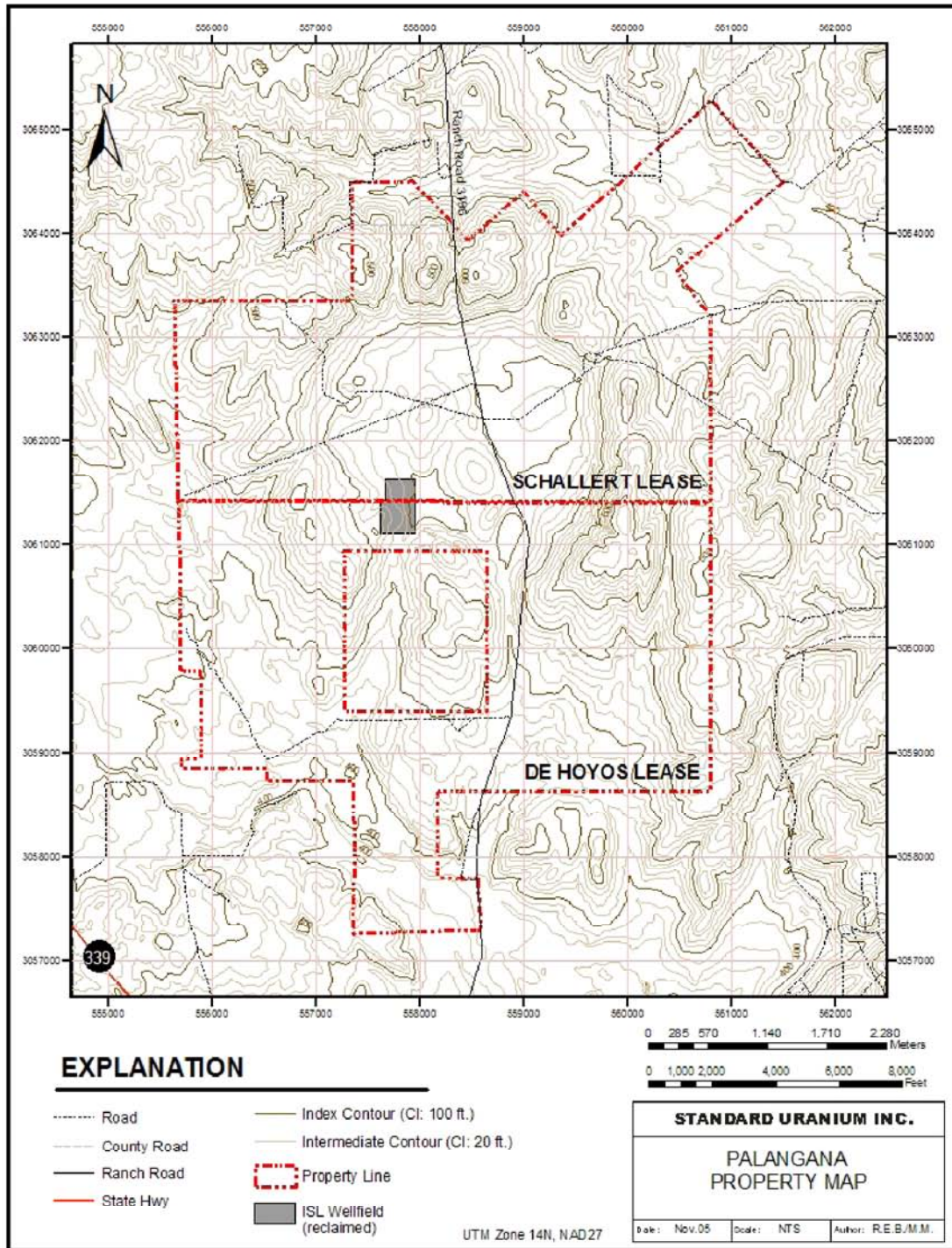


**Figure 4.1. South Texas location map for Palangana-Hobson Project.**

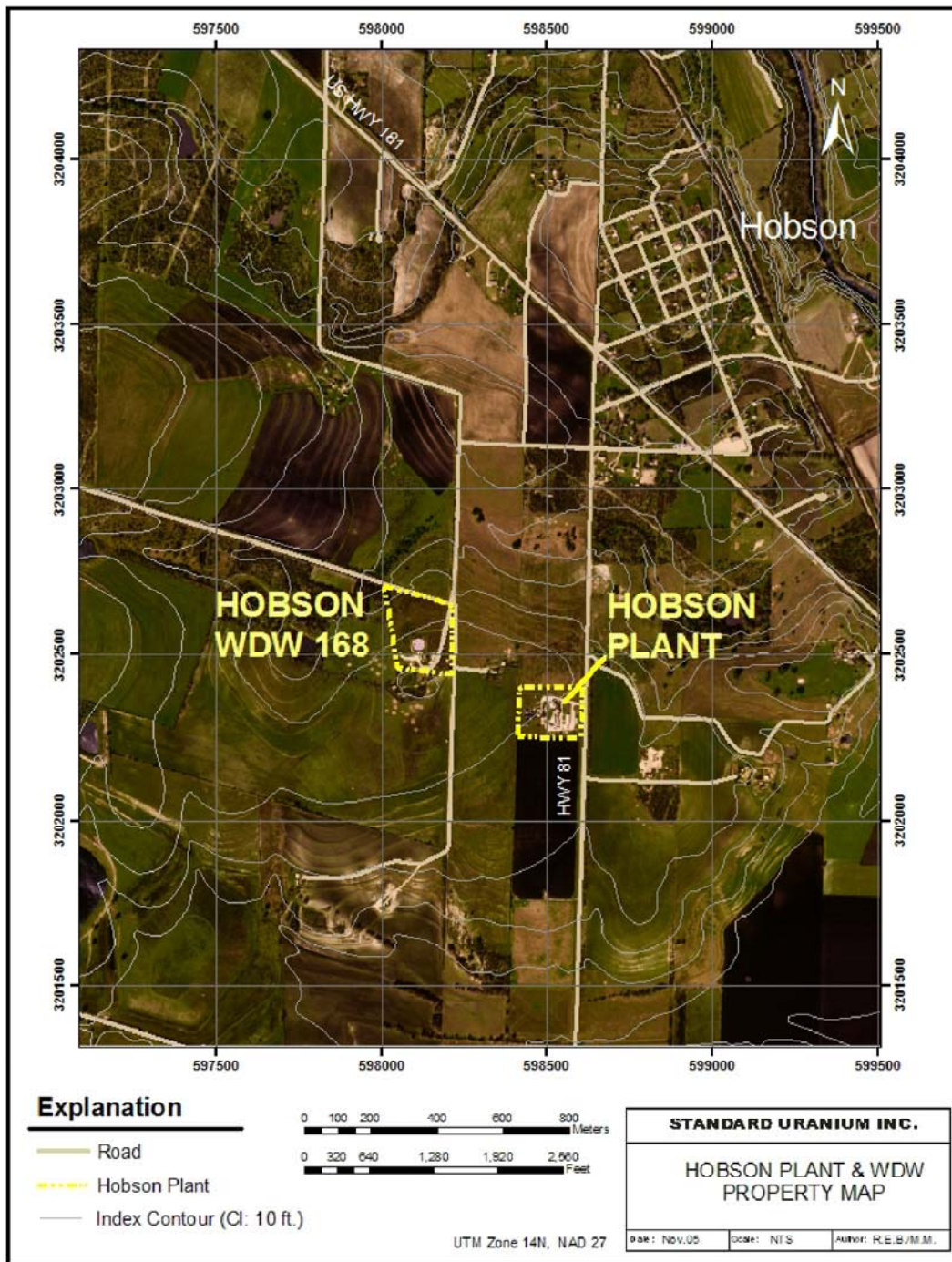




**Figure 4.2. Palangana property land status map.**

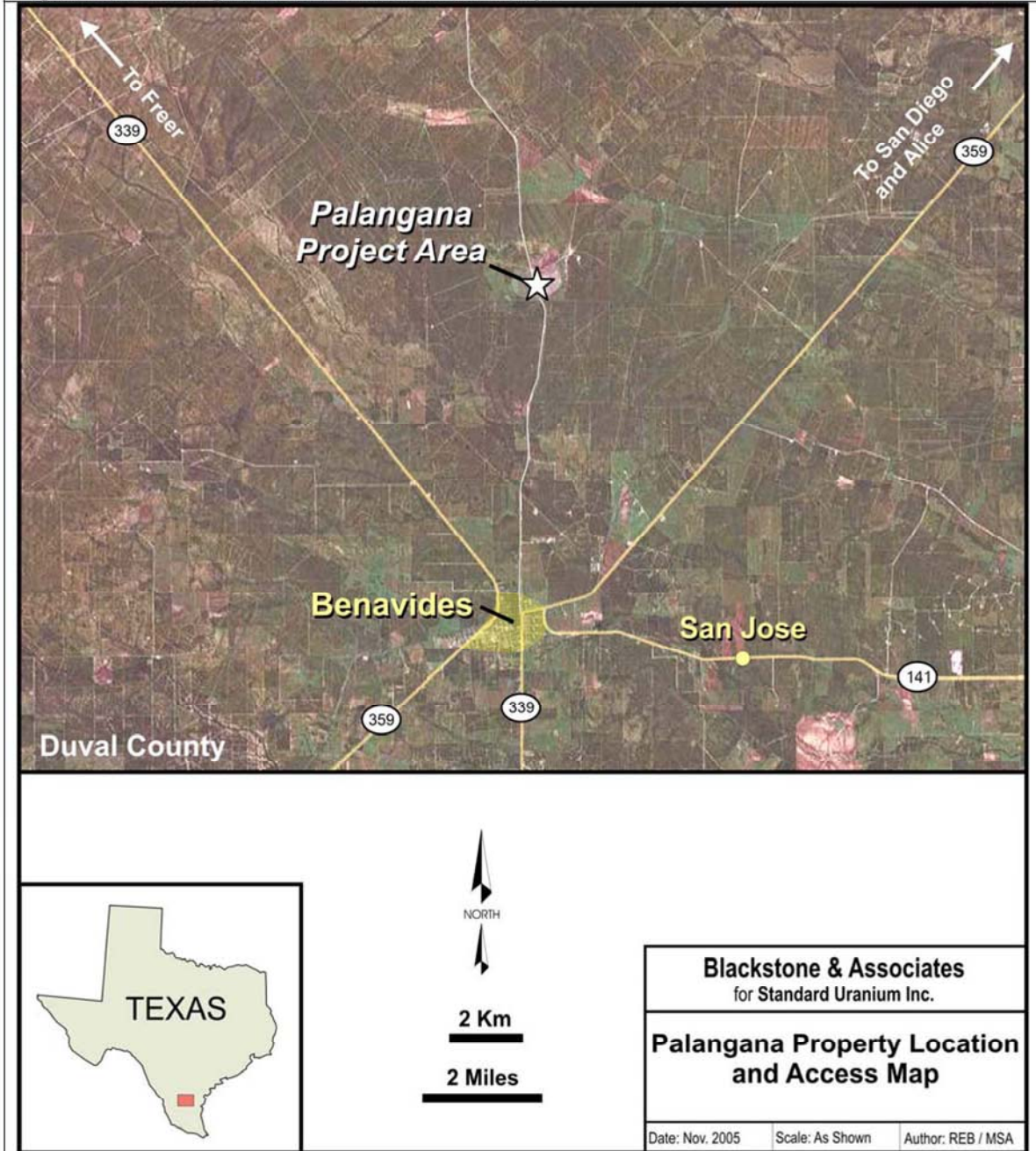


**Figure 4.3. Hobson plant land status map.**





**Figure 5.1. Palangana location and access map.**



**Figure 5.2. Hobson plant location and access map.**

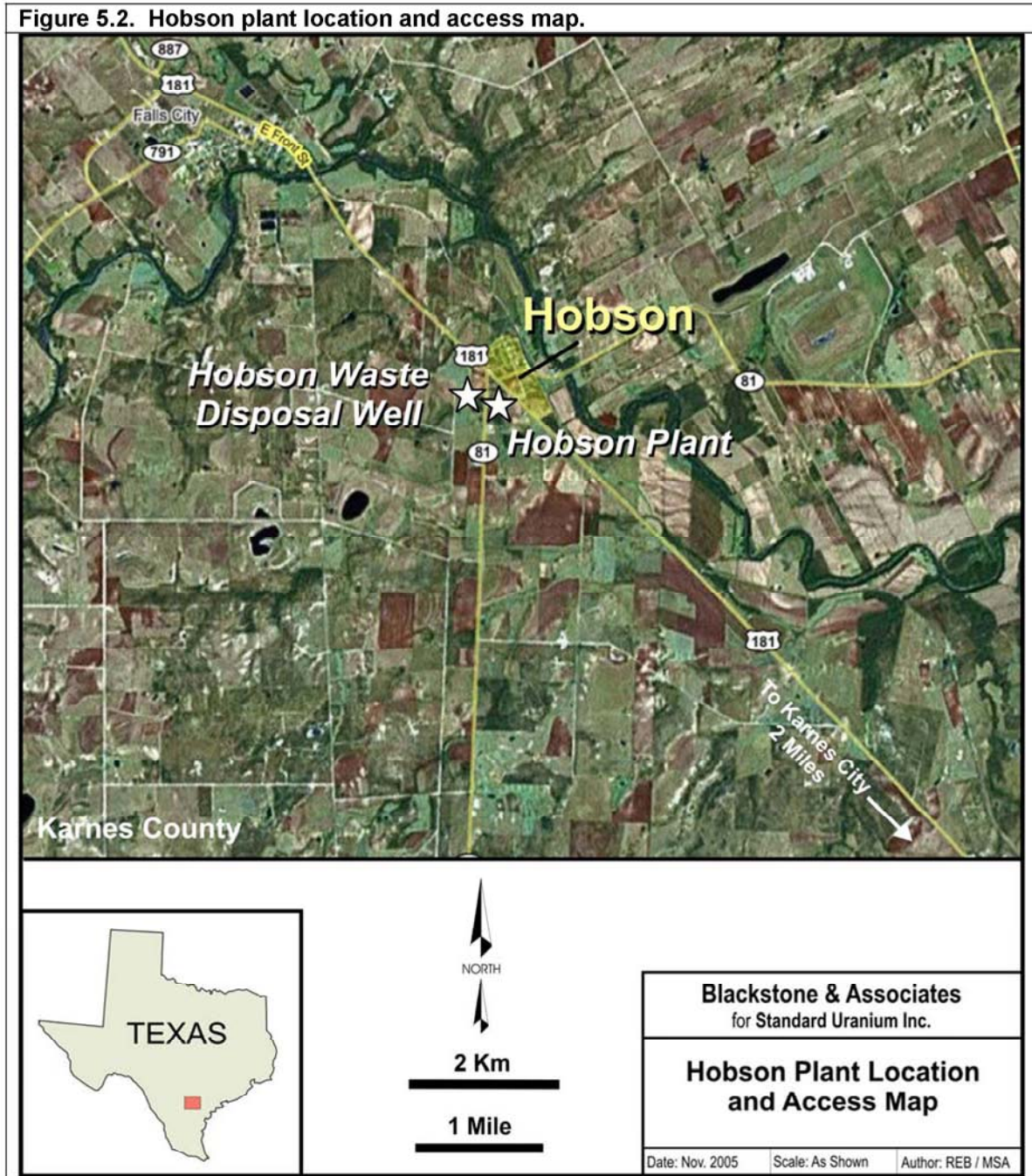
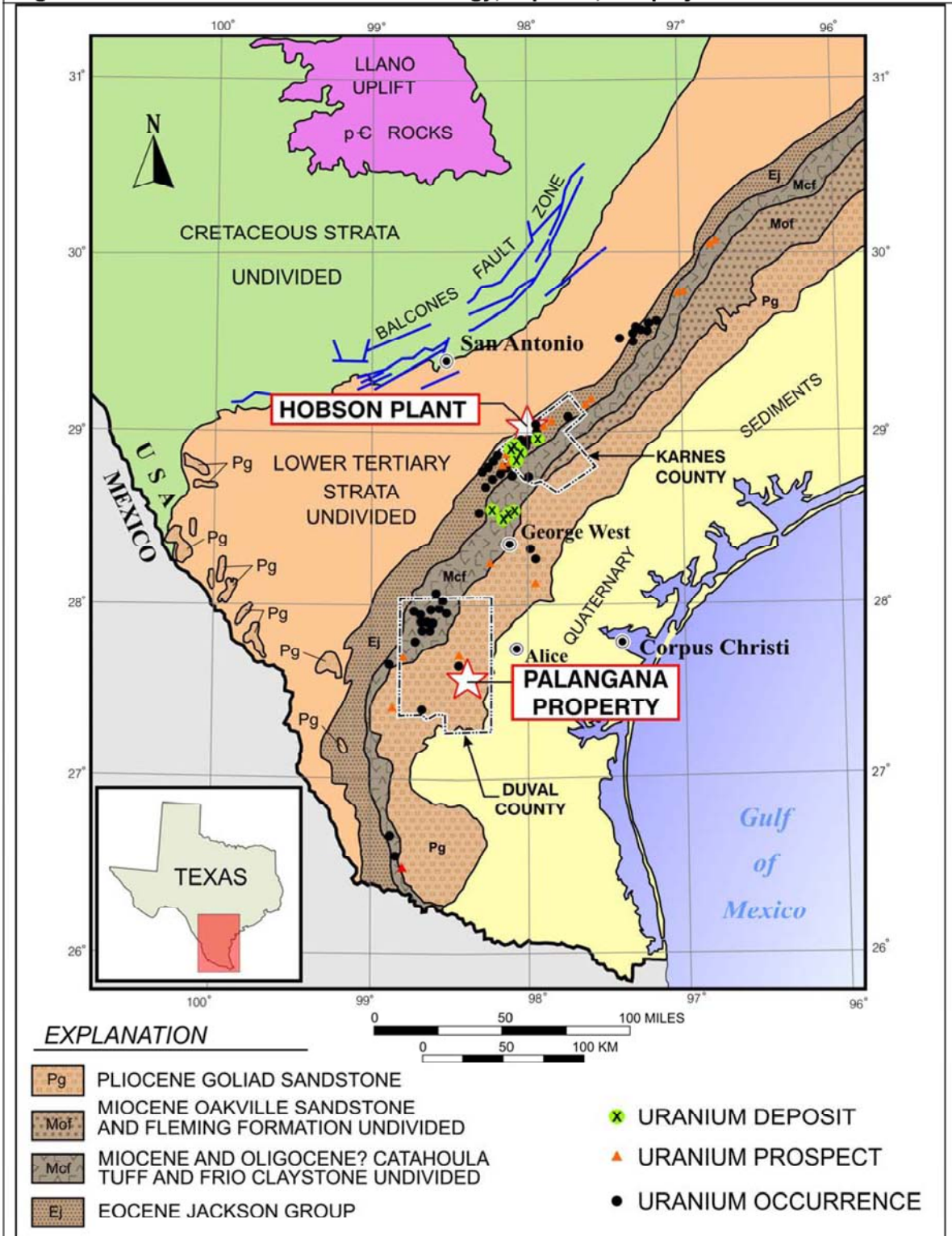




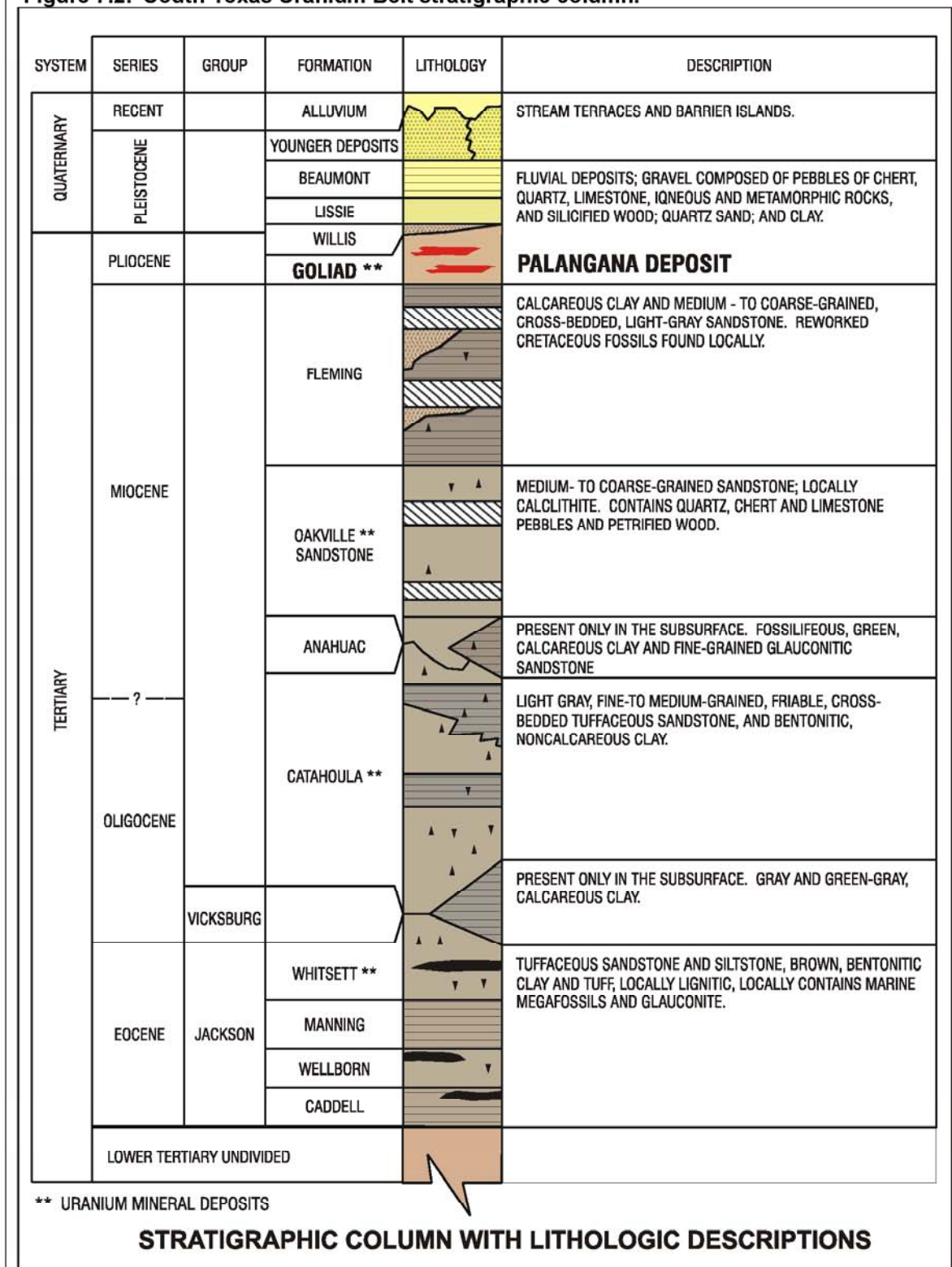
Figure 6.1. Oblique air photo of Hobson plant circa 1986.



**Figure 7.1. South Texas Uranium Belt Geology, deposits, and project location.**

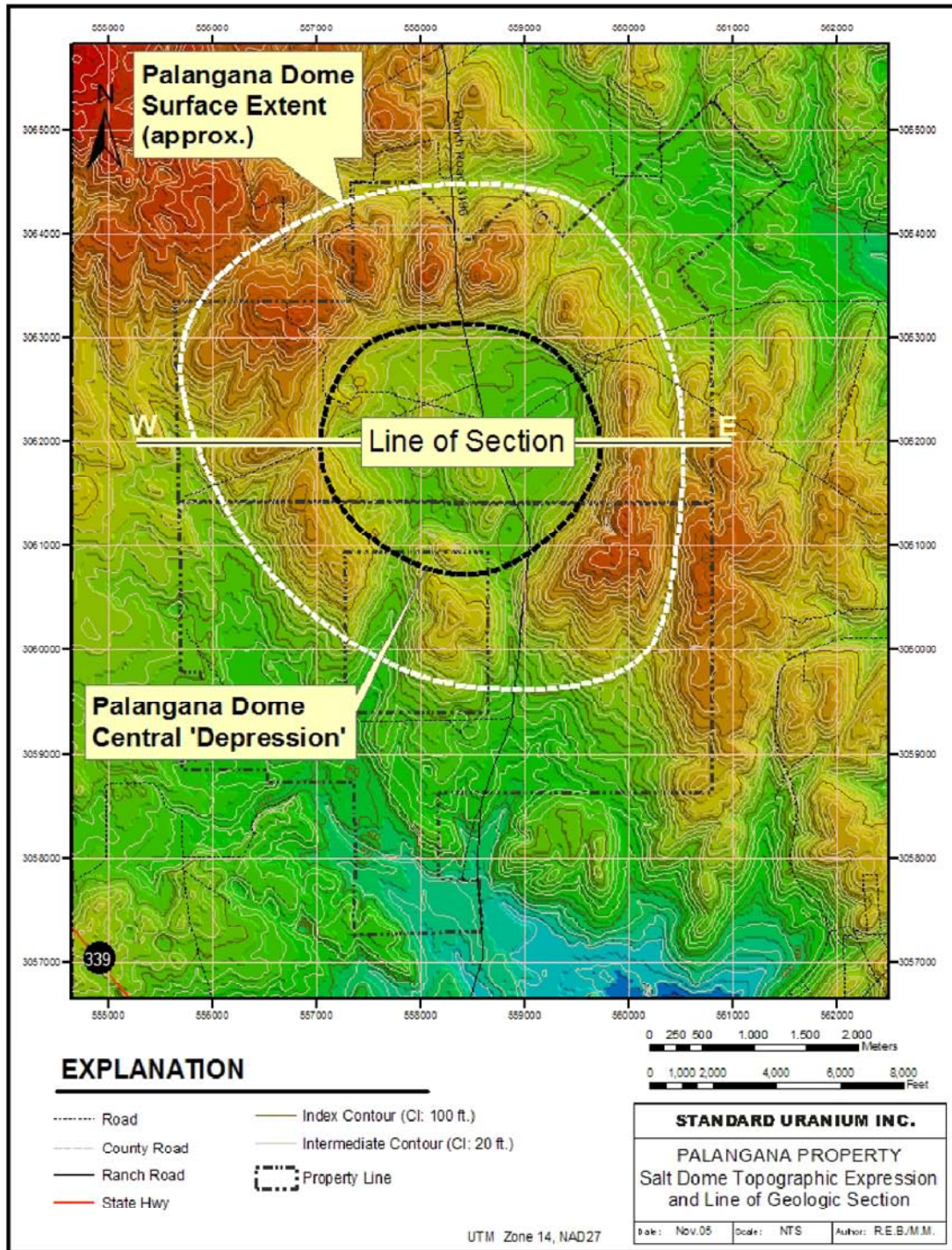


**Figure 7.2. South Texas Uranium Belt stratigraphic column.**



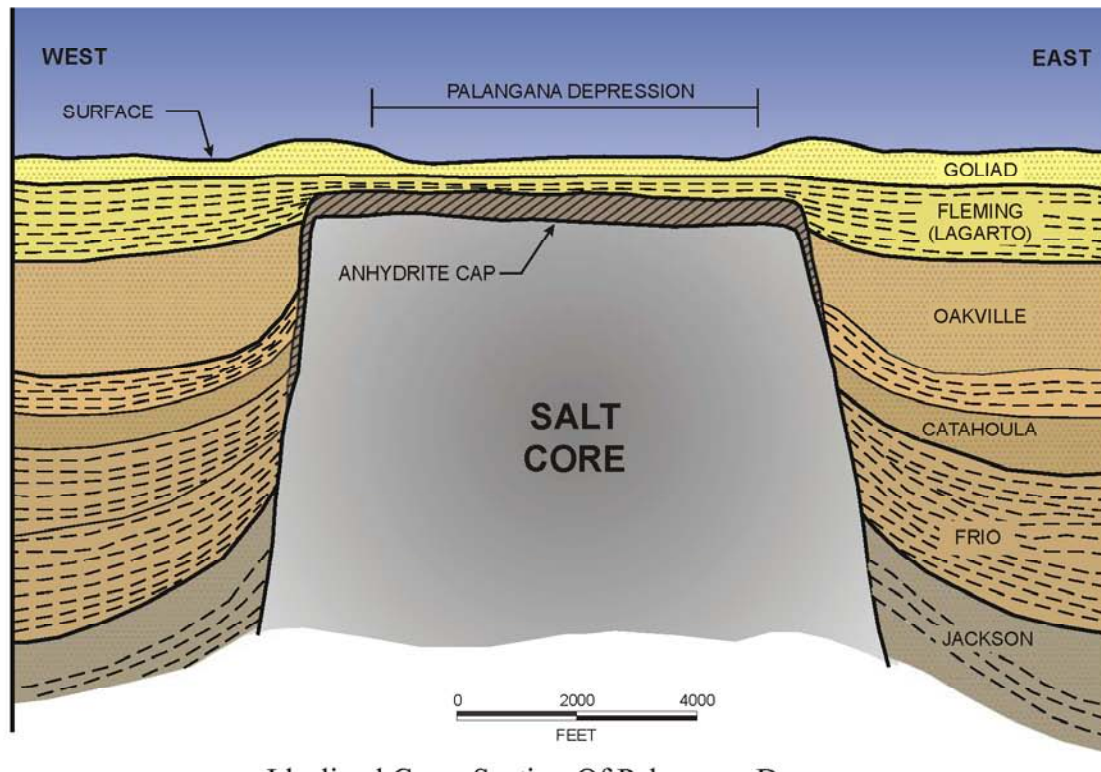


**Figure 7.3. Palangana dome topographic expression and reference line for geologic section.**



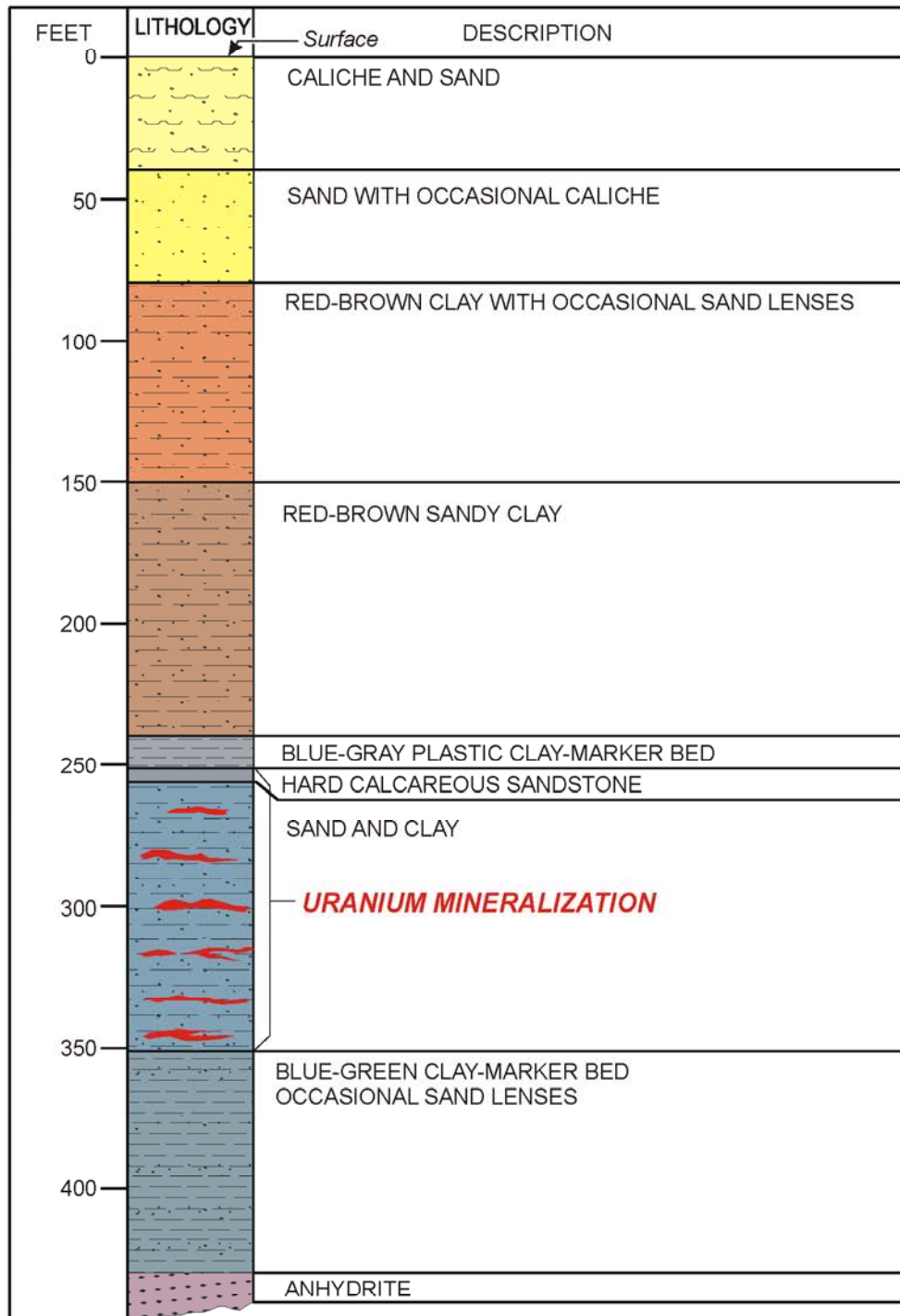


**Figure 7.4. Palangana Dome idealized geologic section.**



**Idealized Cross Section Of Palangana Dome**

**Figure 7.5. Goliad Formation Palangana Dome stratigraphic section.**



MERAK, 1997 DAO-6-TM-1

### Lithologic Section of Goliad Formation Overlying The Palangana Dome

Figure 8.1. Idealized model of Palangana sandstone-hosted roll front uranium mineralization.

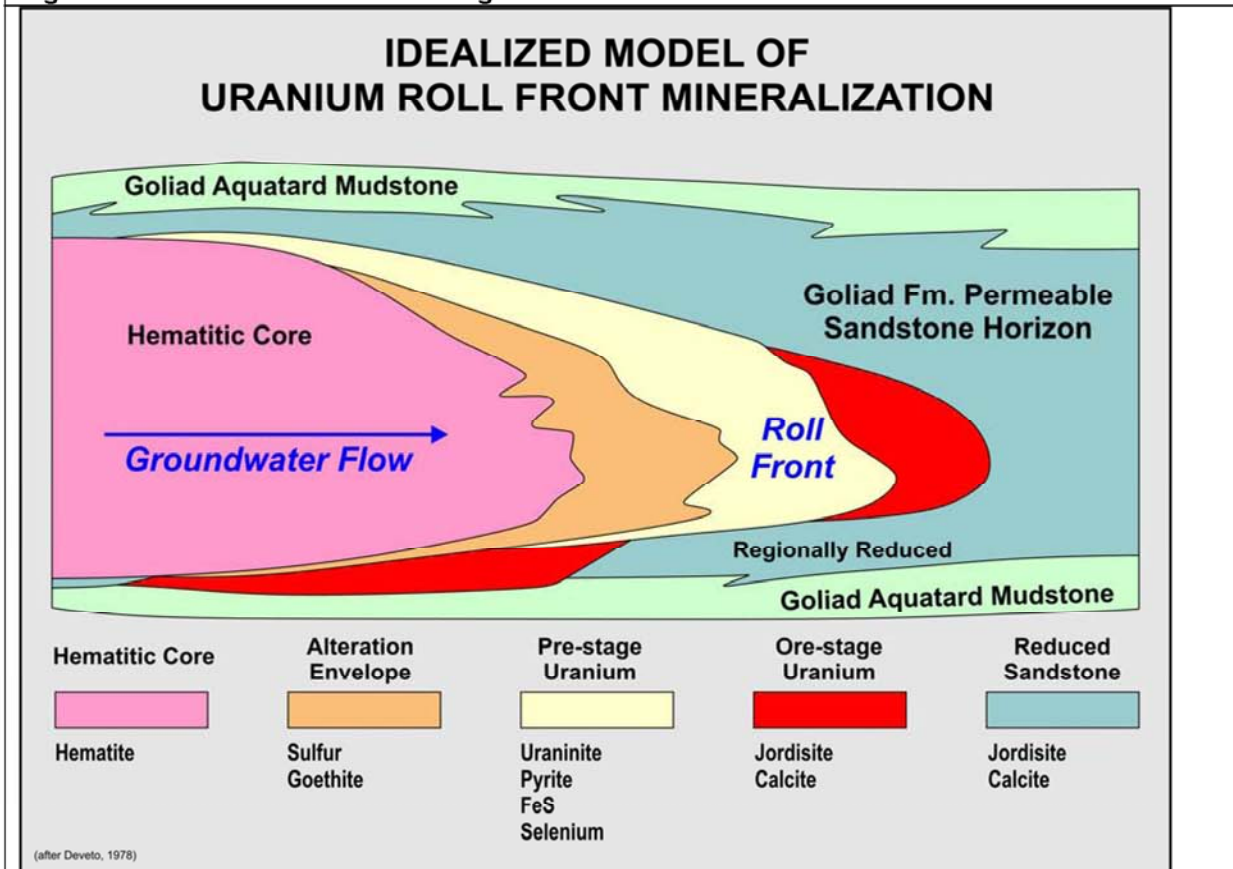




Figure 9.1. Palangana UCC & Chevron drill hole location map with lines of section.

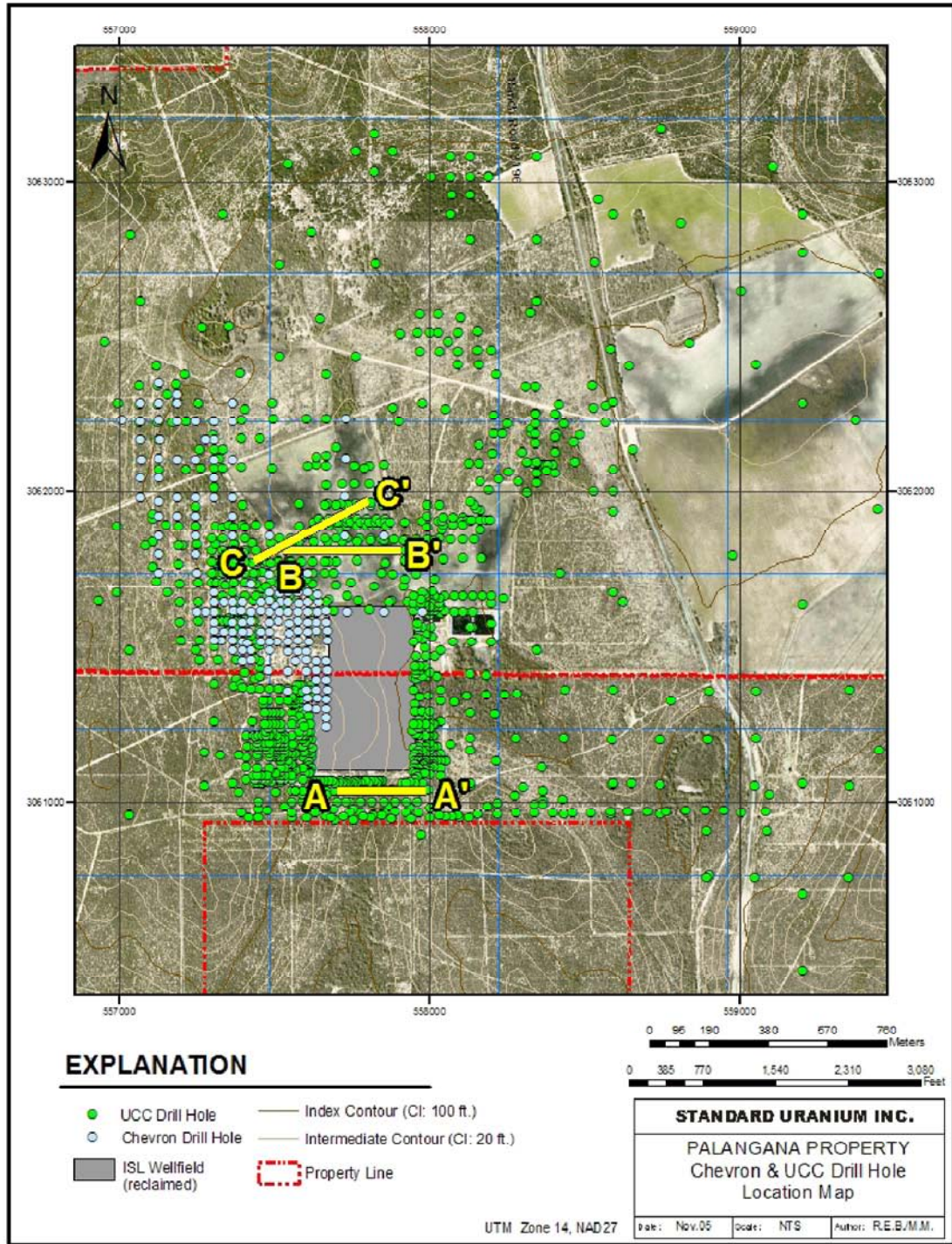
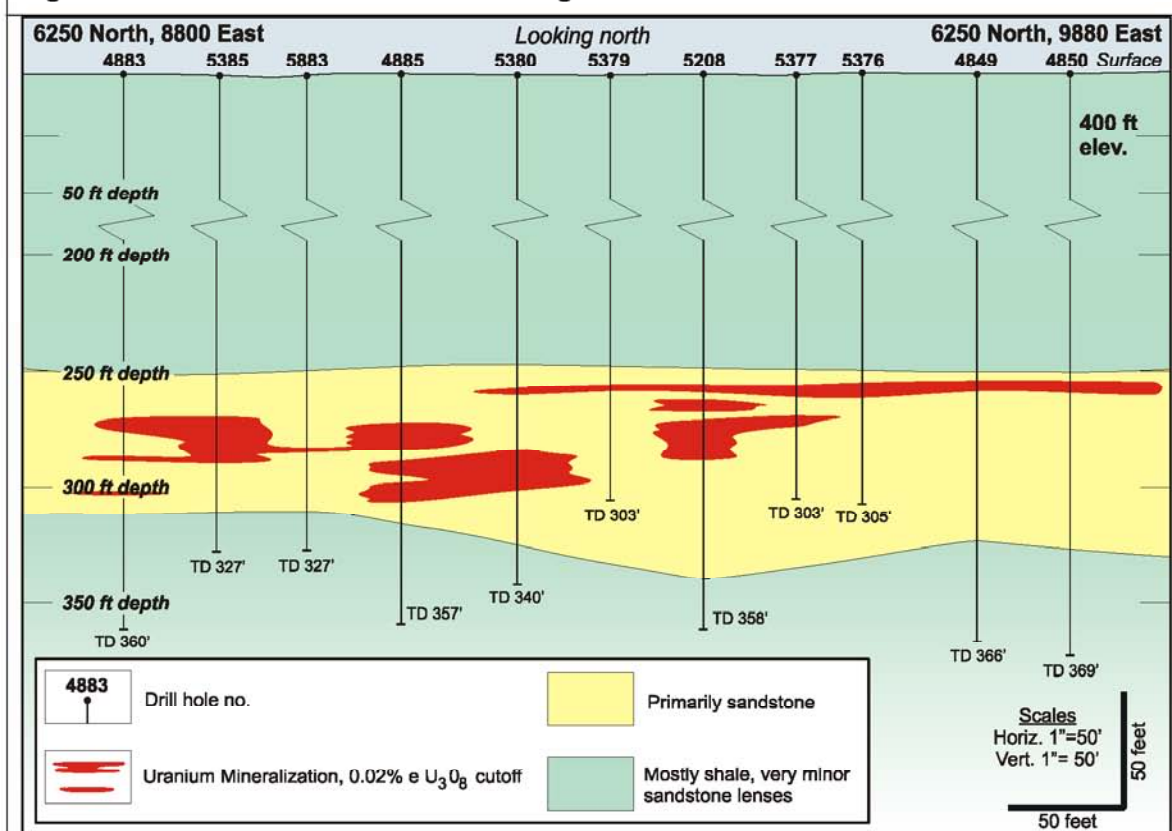
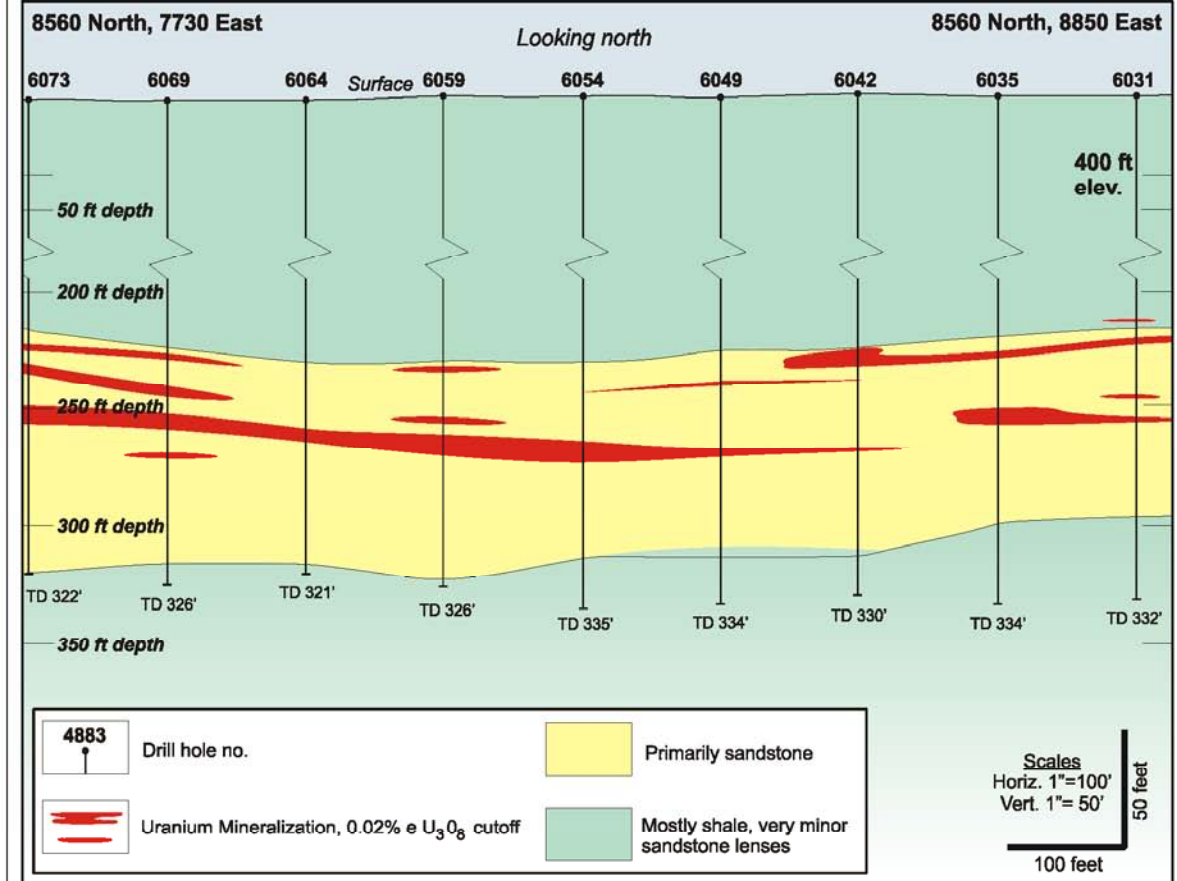


Figure 9.2. East-west section A-A' showing roll front mineralization.



**Figure 9.3. East-west section B-B' showing roll front mineralization.**



**Figure 9.4. Southwest-northeast section C-C' showing roll front mineralization.**

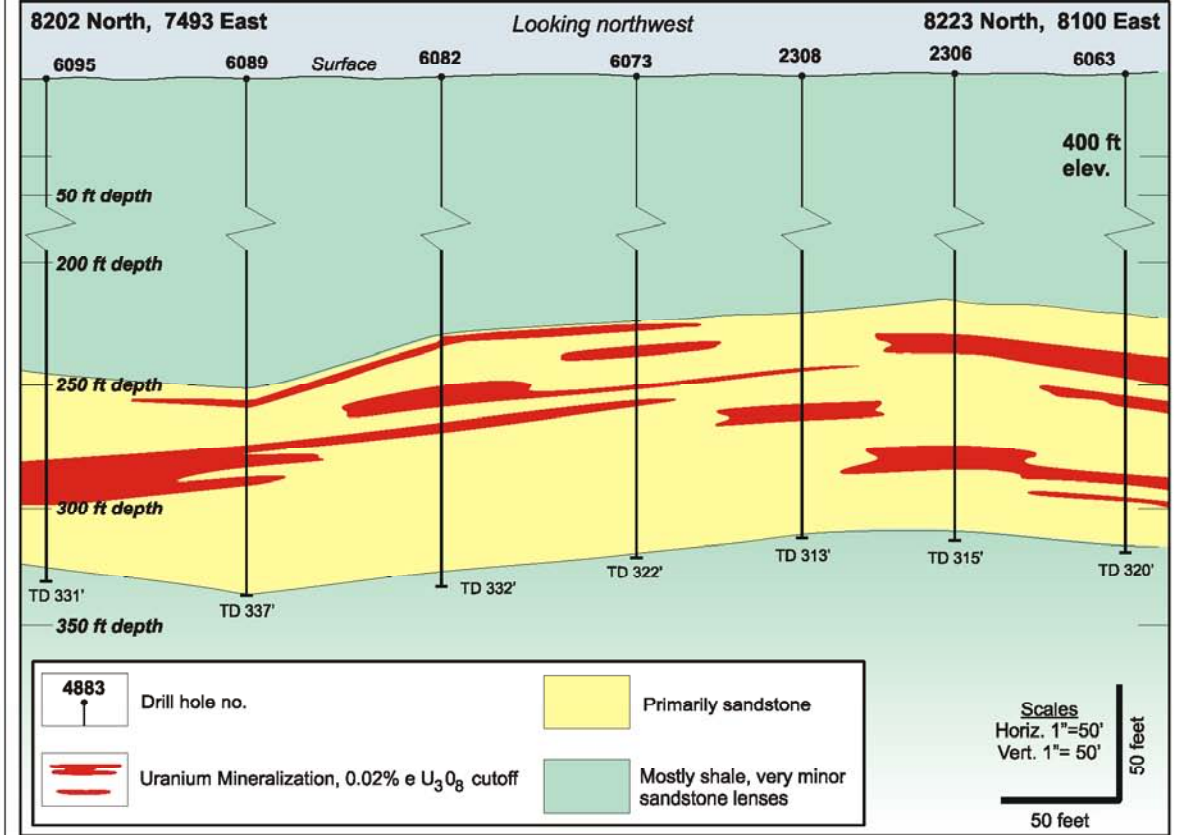




Figure 11.1. Palangana UCC drill hole location map on air photo.

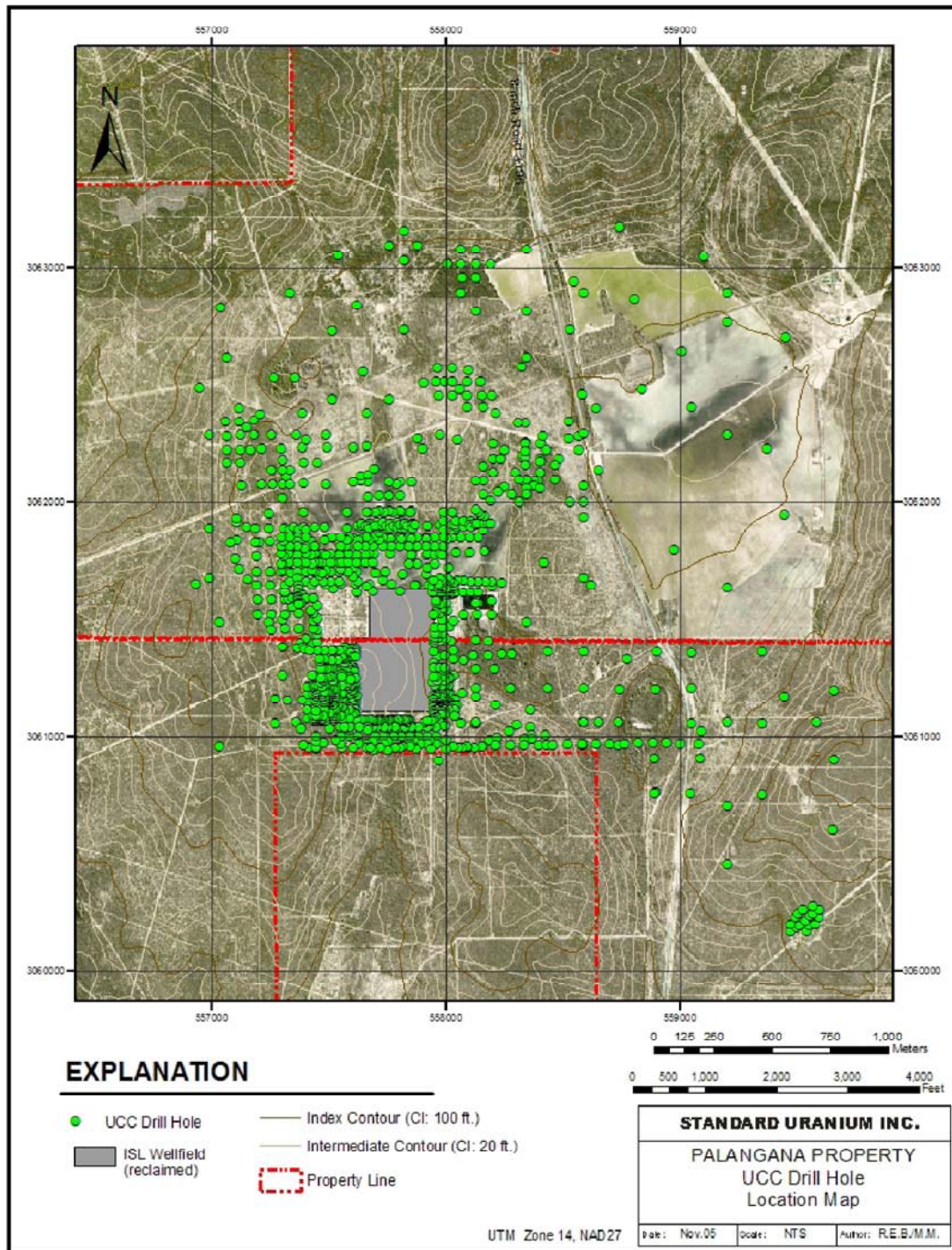




Figure 11.2. Palangana UCC & Chevron drill hole location map on air photo.

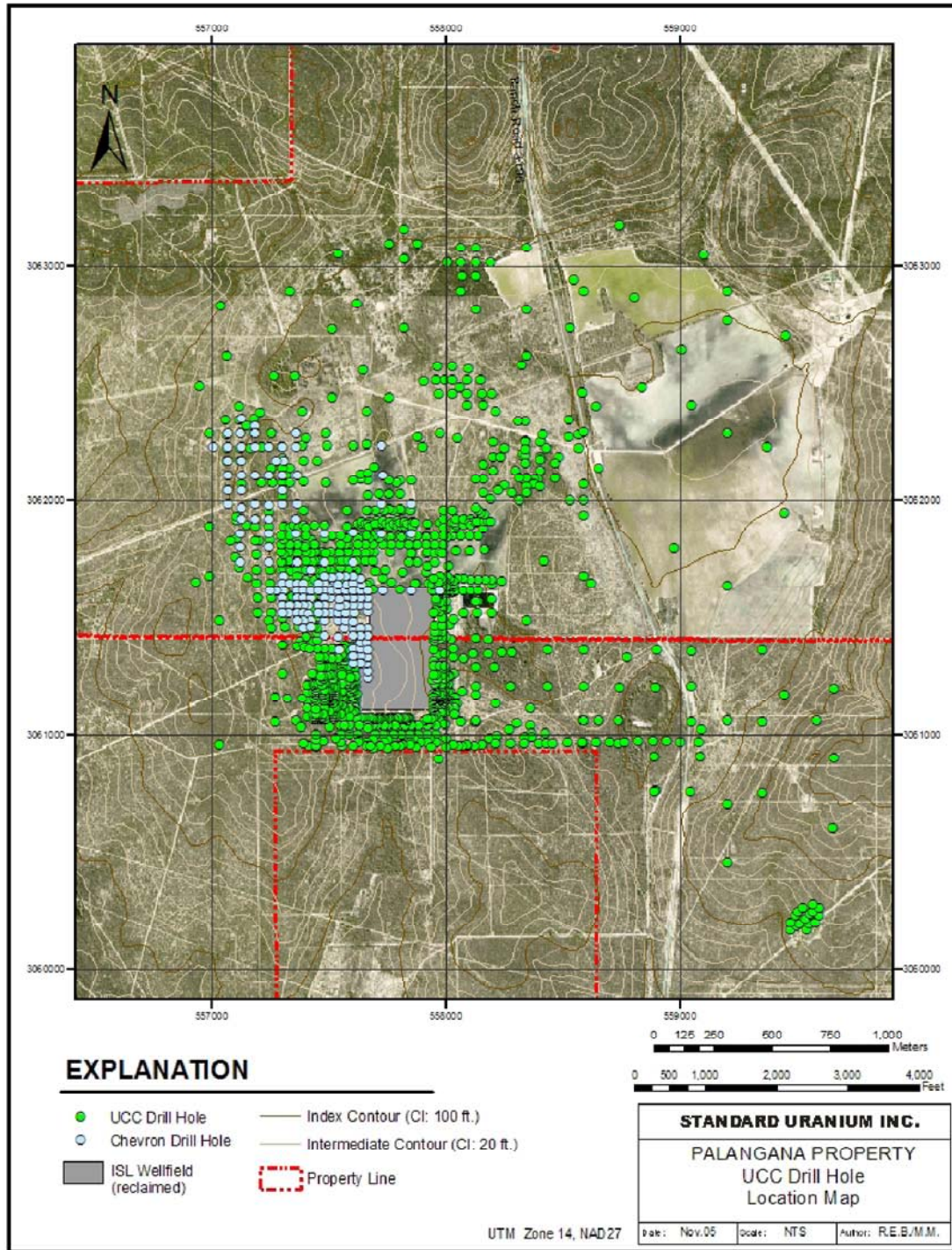




Figure 11.3. UCC and Chevron drill holes by maximum grade intercept.

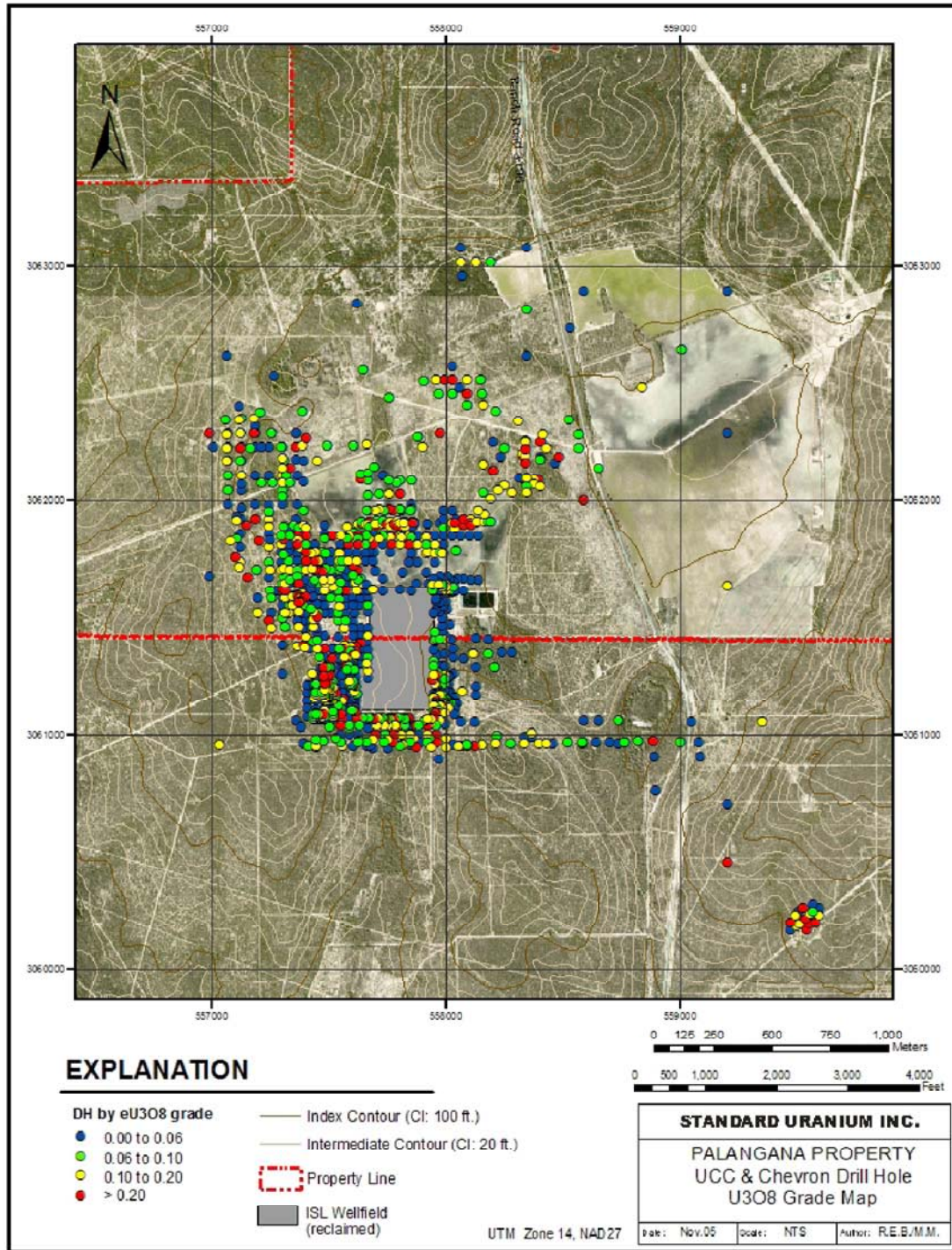


Figure 14.1. Schematic of Palangana ISL wellfield configuration.

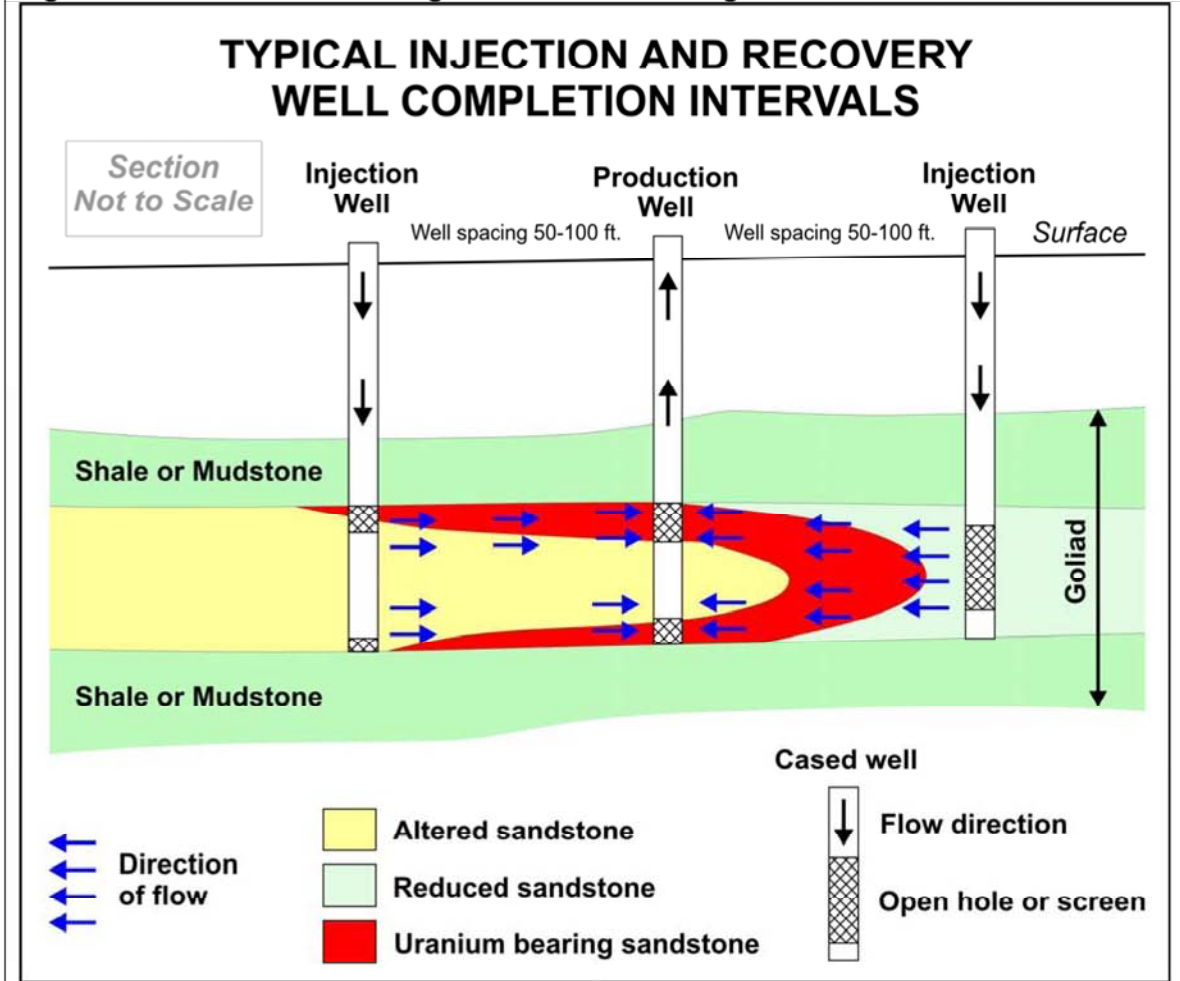
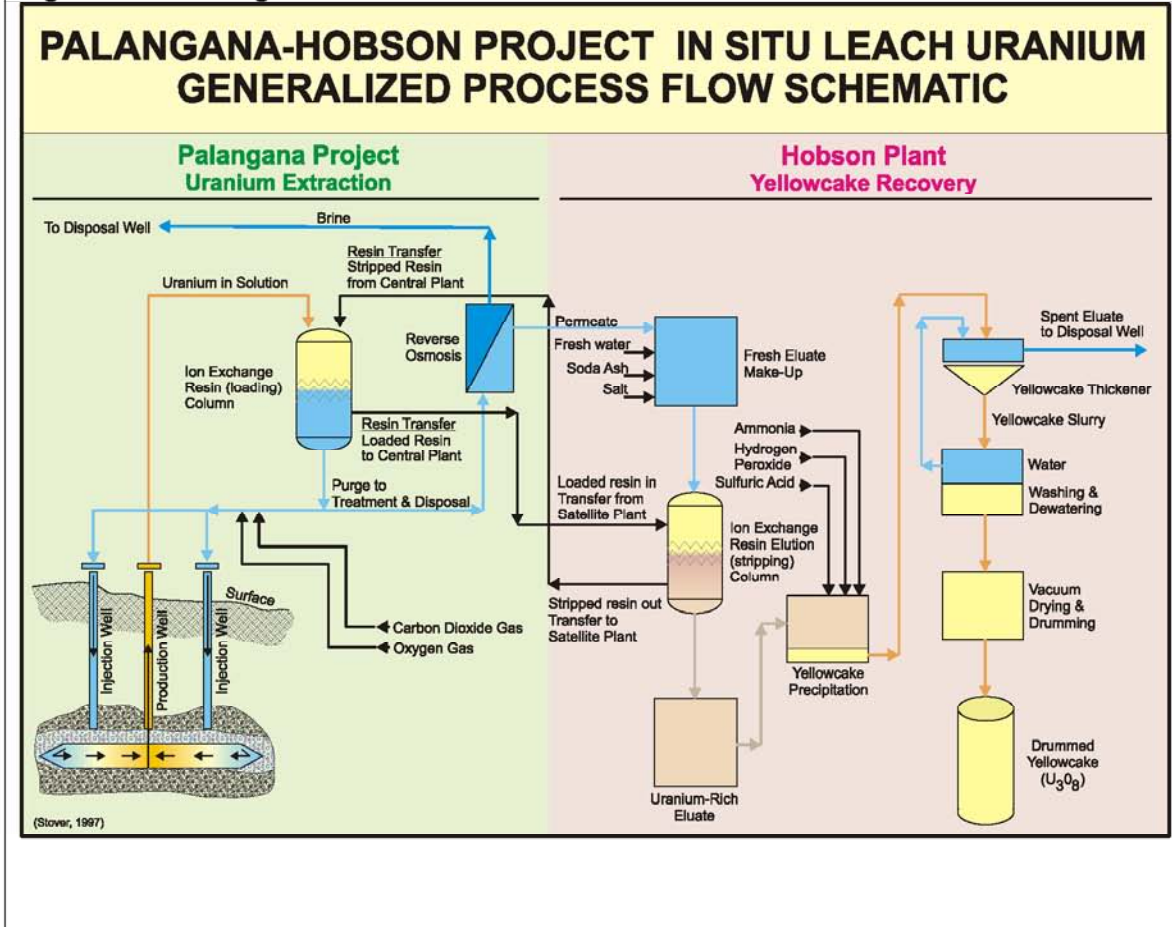
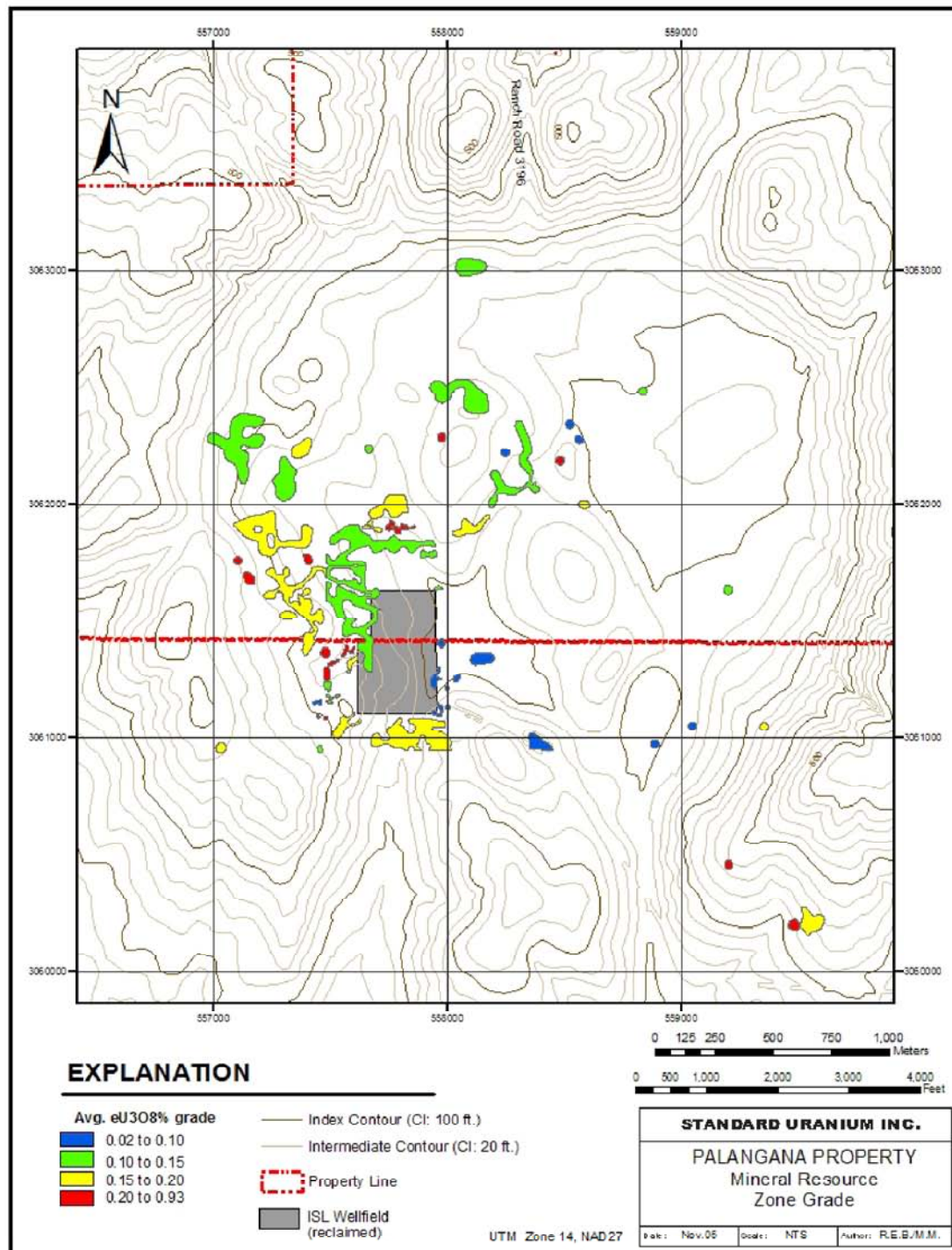


Figure 14.2. Palangana-Hobson ISL Flow Schematic.





**Figure 15.1. Palangana mineral resource polygon eU3O8 grade map.**



**Figure 15.2. Palangana mineral resource polygon thickness map.**

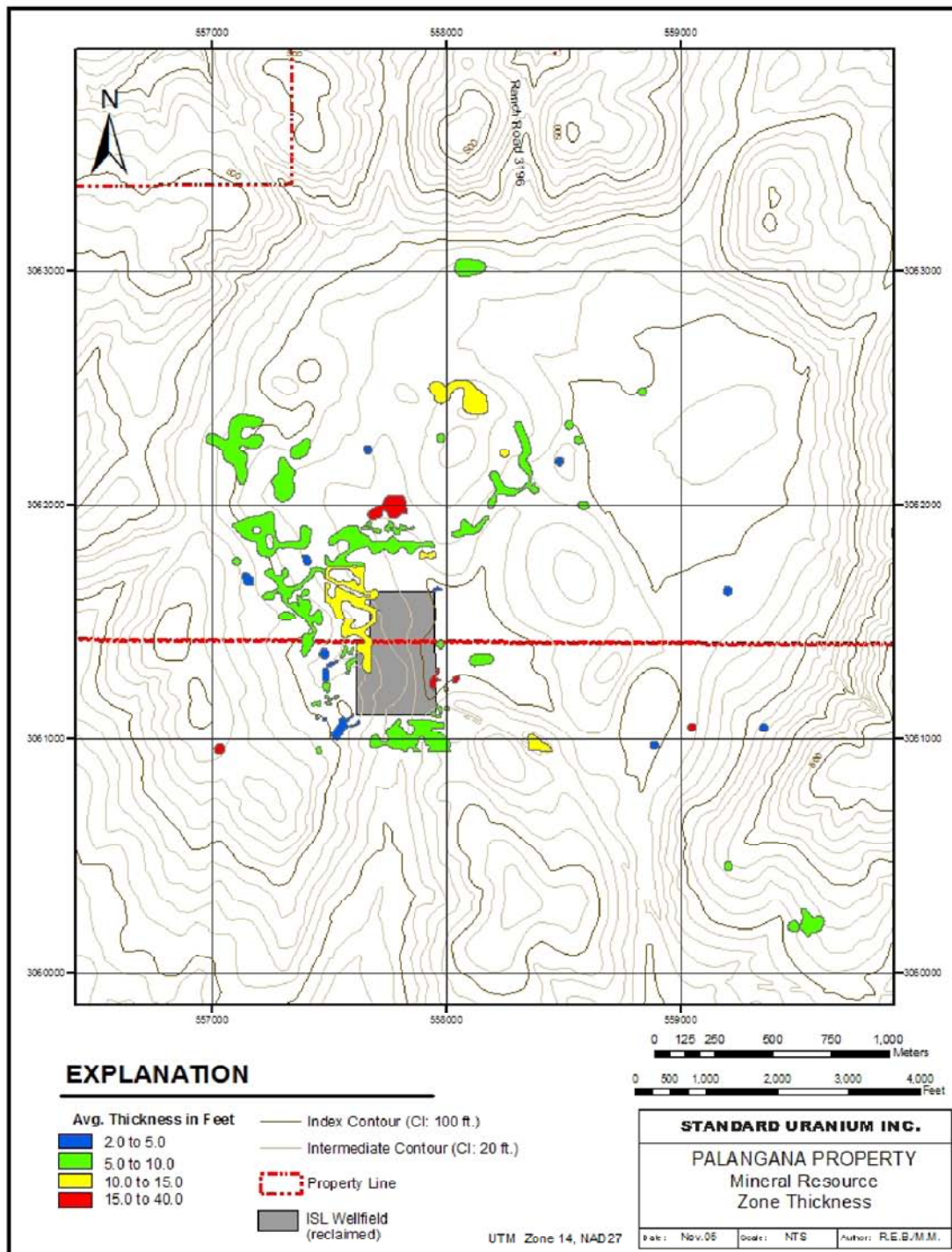
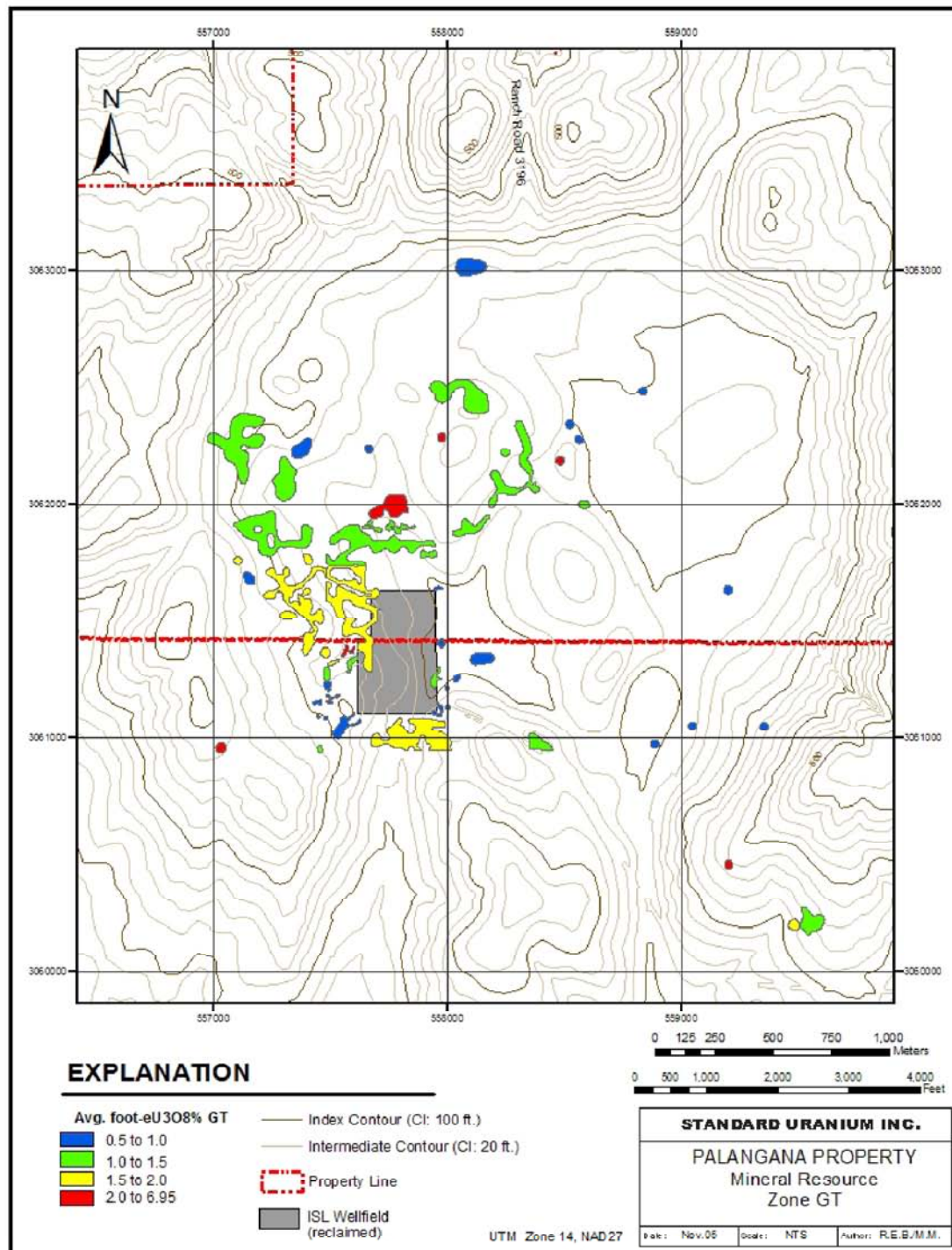




Figure 15.3. Palangana mineral resource polygon GT map.



## **21.0 APPENDICES**



APPENDIX 1  
PALANGANA INFERRED RESOURCE CALCULATION  
0.50 GT Cutoff, 0.02% U3O8 Cutoff, 17 Cubic Ft/ton

Block No.	Ore Area (Sq. Ft.)	Ore Thickness (Ft)	Avg Grade (%U3O8)	GT	Ore Tons	Pounds U3O8
I	331,175	8.2	0.134	1.10	159,743	428,111
II	58,125	5.2	0.182	0.95	17,779	64,716
III	138,750	8.4	0.131	1.10	68,559	179,625
IV	276,350	7.0	0.175	1.23	113,791	398,269
V	11,475	7.0	0.250	1.75	4,725	23,625
VI	32,550	3.9	0.433	1.69	7,467	64,664
VII	22,275	1.8	0.360	0.65	2,359	16,985
VIII	22,075	9.7	0.170	1.65	12,596	42,826
IX	14,750	2.0	0.780	1.56	1,735	27,066
X	15,650	2.4	0.590	1.42	2,209	26,066
XI	281,150	8.9	0.175	1.56	147,190	515,165
XII	17,650	19.0	0.174	3.31	19,726	68,646
XIII	5,700	7.0	0.100	0.70	2,347	4,694
XIV	1,750	6.0	0.090	0.54	618	1,112
XV	2,950	1.5	0.370	0.56	260	1,924
XVI	6,125	10.0	0.150	1.50	3,603	10,809
XVII	84,250	8.5	0.110	0.94	42,125	92,675
XVIII	221,225	10.8	0.132	1.43	140,543	371,034
XIX	11,300	7.0	0.810	5.67	4,653	75,379
XX	11,300	5.0	0.130	0.65	3,324	8,642
XXI	118,075	15.4	0.173	2.66	106,962	370,089
XXII	28,975	6.0	0.228	1.37	10,226	46,631
XXIII	17,075	8.1	0.182	1.47	8,136	29,615
XXIV	43,000	12.0	0.120	1.44	30,353	72,847
XXV	286,550	9.0	0.131	1.18	151,703	397,462
XXVII	61,900	6.7	0.185	1.24	24,396	90,265
XXVIII	11,025	7.0	0.220	1.54	4,540	19,976
XXIX	51,025	12.0	0.095	1.14	36,018	68,434
XXX	10,250	4.0	0.130	0.52	2,412	6,271
XXXI	11,550	5.0	0.180	0.90	3,397	12,229
XXXII	11,050	17.0	0.040	0.68	11,050	8,840
XXXIII	11,350	6.0	0.930	5.58	4,006	74,512
XXXV	76,450	7.8	0.183	1.43	35,077	128,382
XXXVI	147,000	9.7	0.132	1.28	83,876	221,433
XXXVII	11,000	9.0	0.080	0.72	5,824	9,318
XXXVIII	10,750	6.0	0.090	0.54	3,794	6,829
XXXIX	11,400	7.0	0.140	0.98	4,694	13,143
XL	11,525	13.0	0.080	1.04	8,813	14,101
XLI	10,975	6.6	0.160	1.06	4,261	13,635
XLII	11,150	5.0	0.800	4.00	3,279	52,464

XLIII	385,925	13.2	0.115	1.52	299,659	689,216
XLIV	11,250	9.2	0.755	6.95	6,088	91,929
XLV	14,350	6.4	0.185	1.18	5,402	19,987
XLVI	6,725	3.3	0.550	1.82	1,305	14,355
XLVII	4,500	3.9	0.134	0.52	1,032	2,766
XLVIII	8,275	7.8	0.100	0.78	3,797	7,594
XLIX	44,300	8.8	0.090	0.79	22,932	41,278
L	18,400	16.6	0.064	1.06	17,967	22,998
LI	7,500	39.0	0.020	0.78	17,206	6,882
LII	2,925	10.6	0.085	0.90	1,824	3,101
LIII	12,650	9.8	0.076	0.74	7,292	11,084
LIV	3,300	13.7	0.041	0.56	2,659	2,180
LV	8,725	6.1	0.137	0.84	3,131	8,579
LVI	8,075	5.9	0.109	0.64	2,803	6,111
LVII	98,300	4.7	0.165	0.78	27,177	89,684
LVIII	319,150	10.0	0.161	1.61	187,735	604,507

## **22.0 CERTIFICATION & CONSENT OF AUTHOR**

## CERTIFICATION OF QUALIFIED PERSON AND AUTHOR

I, Robert E. Blackstone, P.G., do hereby certify that:

1. I am currently self-employed as a Consulting Geologist: R.E. Blackstone, Blackstone & Associates Geological Consulting, 340 West "B" Street, Suite 205, Casper, Wyoming 82601, USA.
2. I graduated with a Bachelor of Science degree in Geology from Kent State University, Kent, Ohio, USA, in 1970, and Masters Degree in Geology from the University of Wyoming, Laramie, Wyoming, in 1976.
3. I am a Registered Geologist in the State of Wyoming, License #1588, and I am registered with the American Institute of Professional Geologists, License # 7701. I am a member of the Geological Society of America, the Society of Mining Engineers of AIME, the Rocky Mountain Association of Geologists, Society of Professional Well Log Analysts, The American Association of Petroleum Geologists, and the Wyoming Geological Association.
4. I worked as a geologist for 29 years after receiving my M.Sc. degree in 1976.
5. I have read the definition of "qualified person" setout in NI 43-101 and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements of "qualified person" for the purposes of NI 43-101.
6. I am responsible for all sections of this technical report. I visited the Palangana property and Hobson plant on August 25, 2005. I have worked in the uranium business as a geologist for a total of 15 years with Kerr McGee Corp. and Rio Algom Mining Corp. on both conventional mining and in-situ leach projects. I've been involved with numerous project evaluations including the Rio Algom evaluation of URI's, Kingsville Dome Project in South Texas.
7. I have had no prior involvement with the Hobson Plant or the Palangana property.
8. I am unaware of any material fact or material change with respect to the subject matter of the technical report that is not reflected in the technical report, the omission to disclose which makes the technical report misleading.
9. I am independent of the issuer applying all of the tests in section 1.5 of National Instrument 43-101.
10. I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report titled: "Technical Report on the Palangana and Hobson Projects" and it has been prepared in compliance with that instrument and form.
11. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Dated this 14<sup>th</sup> day of November, 2005.



Signature of Qualified Person

Robert E. Blackstone, P.G.  
Qualified Person



## CERTIFICATION OF QUALIFIED PERSON AND AUTHOR

To: B.C. Securities Commission, Alberta Securities Commission, and also to the TSX Venture Exchange.

I, Robert E. Blackstone, P.G., do hereby consent to the filing with the concerned regulatory authorities of the Report titled "Technical Report on the Palangana and Hobson Uranium In Situ Leach Project, Duval and Karnes Counties, Texas", with an effective date of November 10, 2005, to the written disclosure of the Technical Report and of abstracts from or summary of the Technical Report in the written disclosure, filings, or other information forms of Standard Uranium Inc. being filed.

Dated this 14th day of November, 2005.



Robert E. Blackstone, P.G.  
Registered Geologist  
Wyoming License # 1588.

