# A complex ≥ 30 km secondary Impact Crater near Port Headland in the Pilbara region in West-Australia

**see also Part 1 to 6** of my study : "**Global Impact Events are the cause for Plate Tectonics and the formation of Continents and Oceans**"

( → Please find my other studies on vixra.org, archive.org , or soon on this website : www.permiantriassic.de )

by **Harry K. Hahn** / Germany - **8. July 2017**



**Abstract :**

The magnetic anomaly map, satellite images and geological maps indicate a Ø 40 x 33 km elliptical Impact Crater and complex impact structures caused by this crater, near Port Headland ( in the Pilbara Craton / West-Australia ). This elliptical Impact Crater probably was formed by a large secondary impactor ( ejecta material ) which was ejected by another larger secondary Crater, in all probability caused by the Permian-Triassic (PT)- Impact Event 253 Ma ago, near Onslow, a town on the NW-coast. The larger secondary Crater near Onslow probably also caused the Iron-ore rich Hammersley Range in Western Australia.

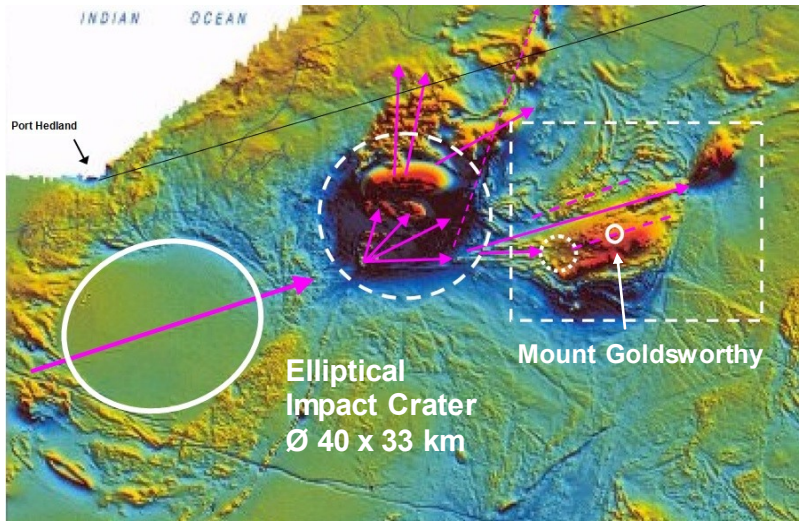
The Ø 40 x 33 km elliptical impact crater near Port Headland shows a distinct center-line on the magnetic anomaly map, which is a clear indication for an oblique impact. That means the impactor which formed the elliptical crater impacted in a very shallow angle of probably less than 15 degrees.

Further along the trajectory of the impactor, complex impact structures were formed by the ejecta material that was ejected from the Ø 40 x 33 km elliptical Impact Crater. These impact structures are good visible on the satellite images. Near the Goldsworthy Iron-ore mine there are two areas are noticeable where ejecta material impacted on the ground and then slipped along the surface in a precise linear direction. On one of the final resting places of the ejecta material the Mount Goldsworthy Iron Ore Mine deposits were formed, which contained the world's richest deposits of ferrous (iron)-ore. The high-grade iron-ore veins of this mine ran deep and were graded as high as 68 % !.

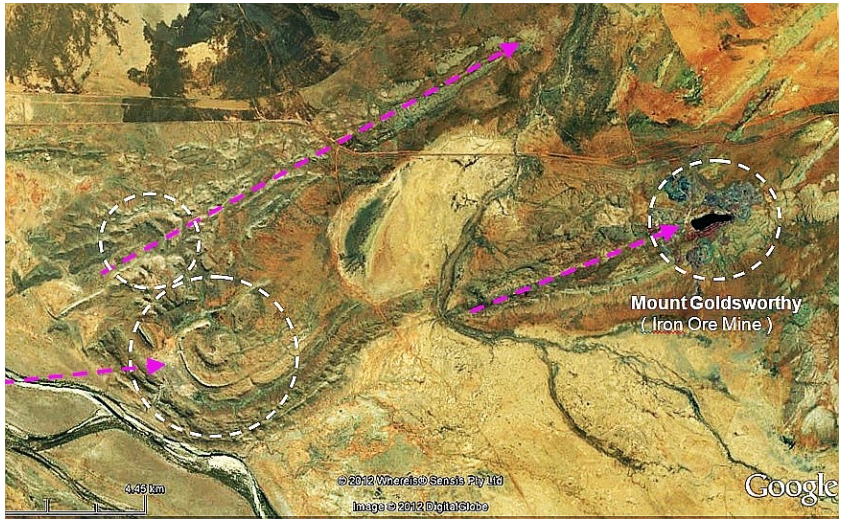
Another interesting impact structure which was caused by impacting ejecta material, that was ejected from the elliptical crater, is a complex cascade-shaped impact structure. The magnetic anomaly map provides the best overview of this cascade-shaped impact structure, which also was caused by iron-rich ejecta material.

For more information to the Permian-Triassic Impact Event 253 Ma ago. → Please see my other studies on www.vixra.org → see weblinks under References on the last page.

**Magnetic Anomaly Map of Impact-crater and -structures**



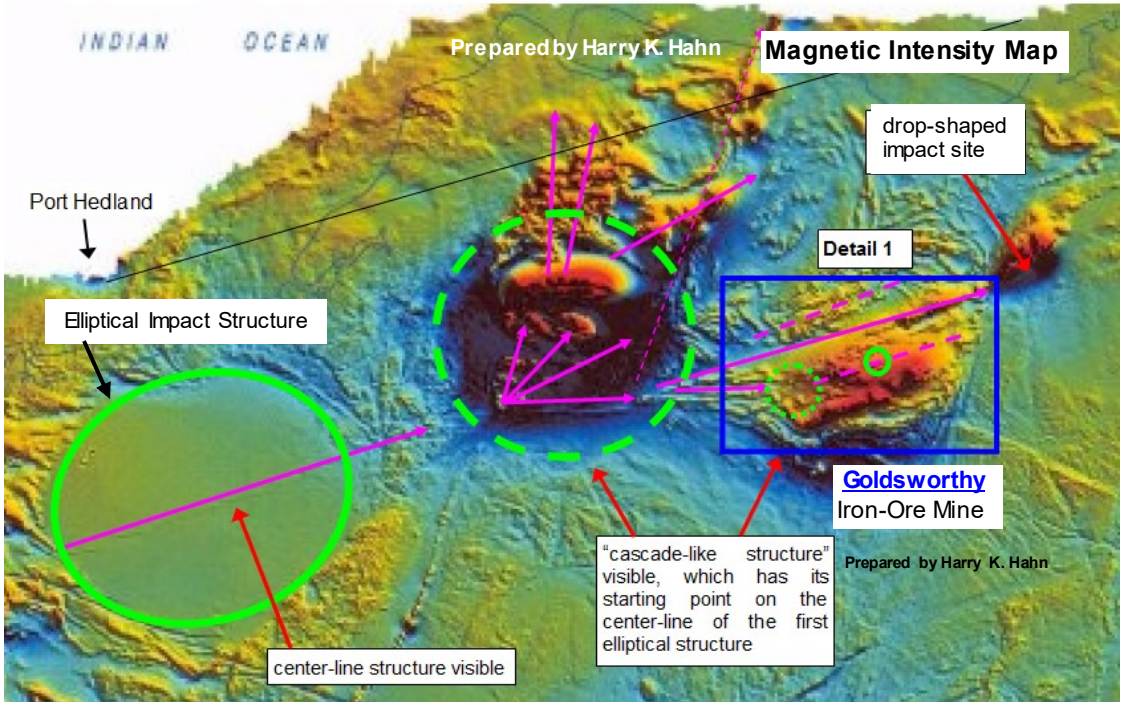

**Satellite Image of impact structures ( Mt Goldsworthy Mine )**

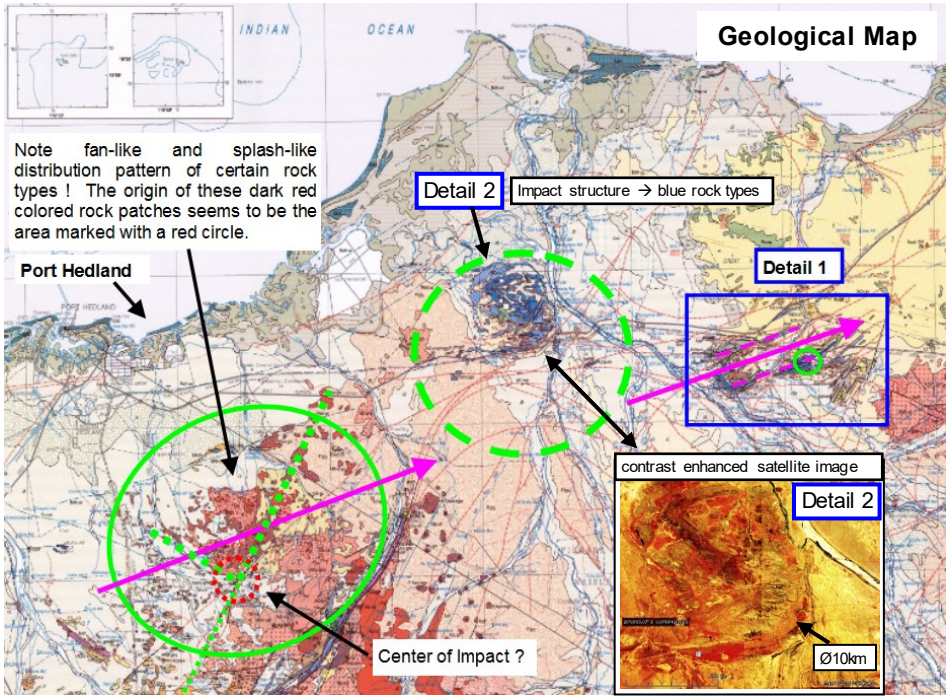


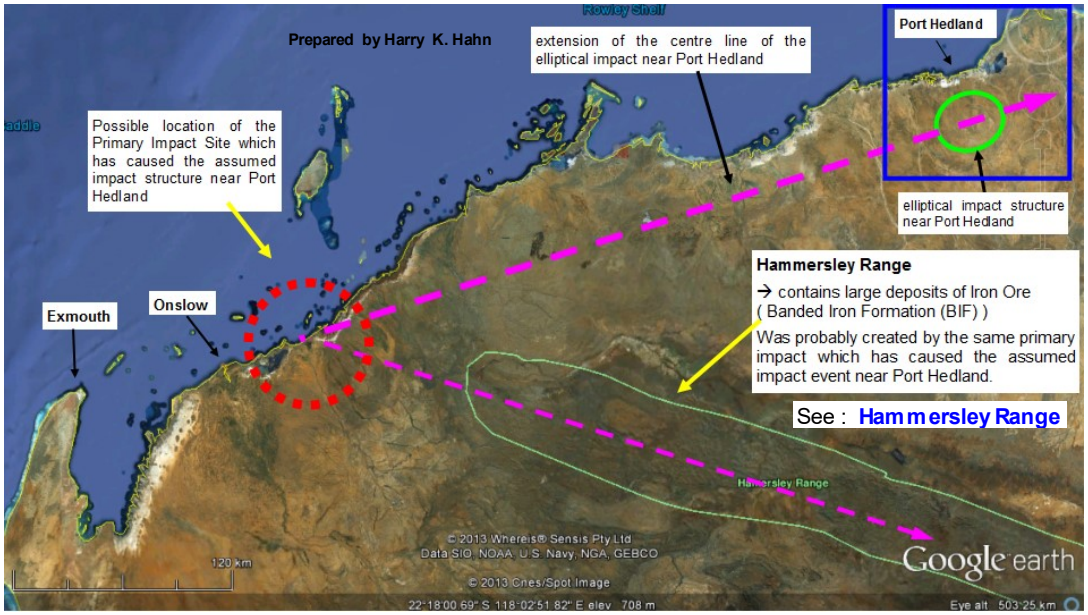

**Iron-rich ejecta outcrops**

## A complex secondary Impact Structure ( > ∅ 30 km Crater ) near Port Hedland in the Pilbara Region ( in NW of West-Australia )

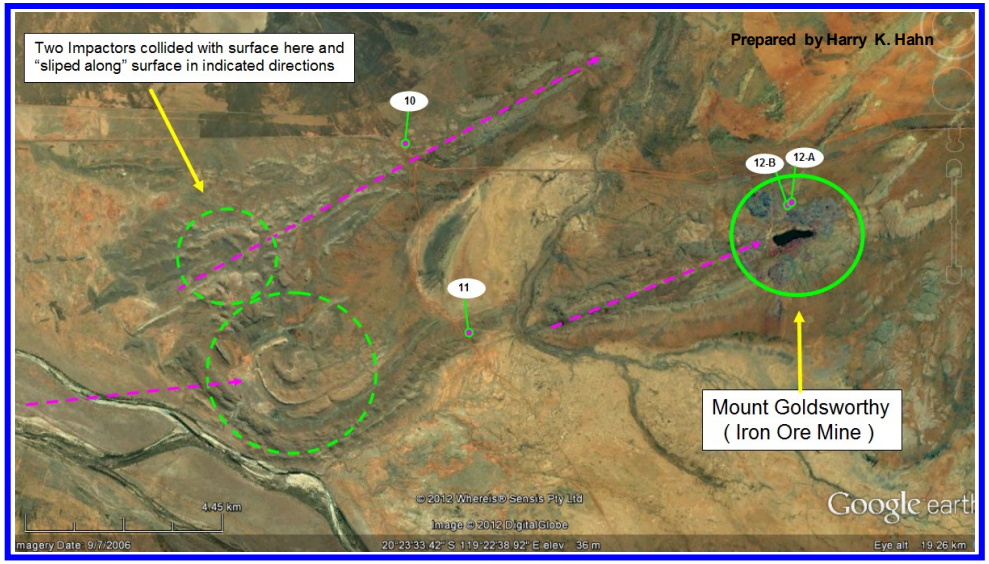
The satellite image, the magnetic intensity map and the geological map indicate a complex impact structure near **Port Headland** ( in West-Australia ), which probably was formed by secondary impactors ( ejecta material ) which were ejected by a large secondary Crater of the PT – Impact Event that probably impacted near Onslow, a town on the NW-coast. This impact structure, which probably also caused the Iron-ore rich Hammersley Range, must be ~ 253 Million years old.



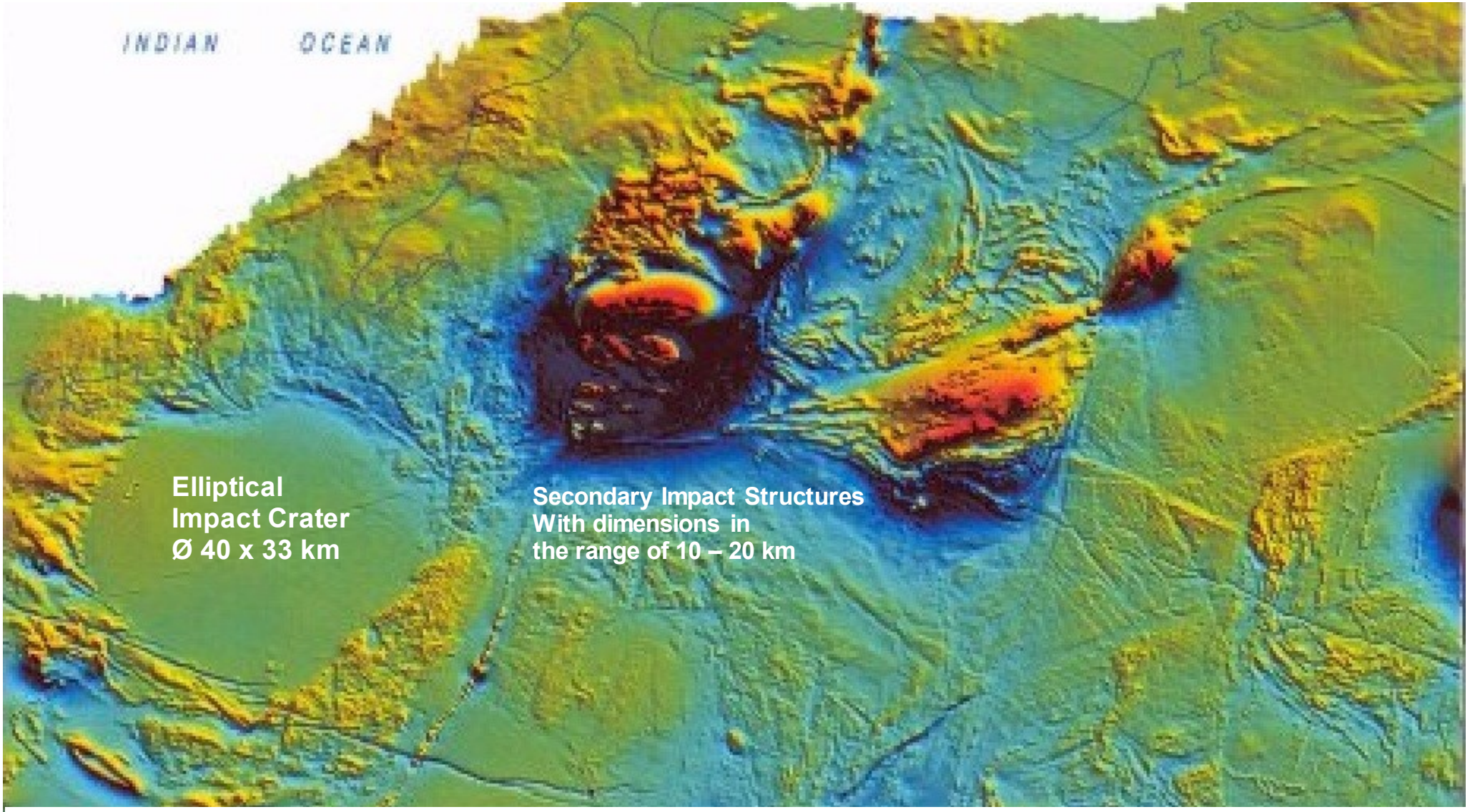




**Detail 1** : Satellite View with marked position of impactor sites & Iron Ore Mine



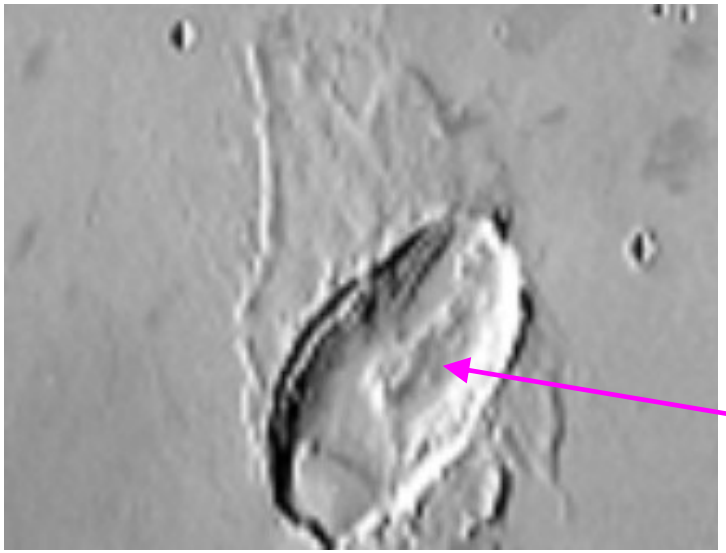
# A complex Secundary-Impact Crater and -structures near Port Hedland ( Pilbara )

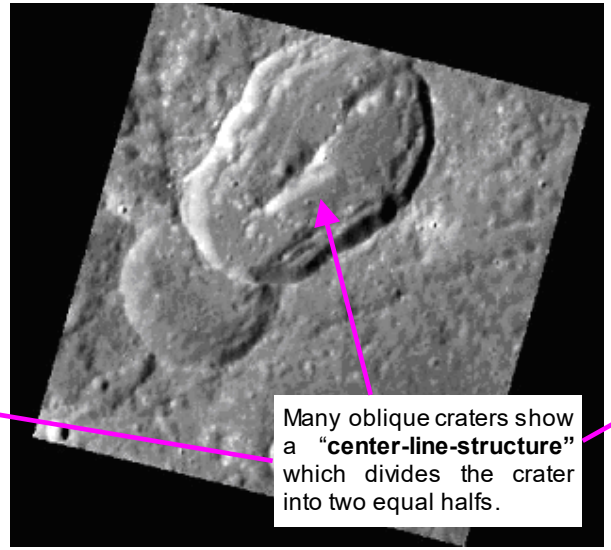
## Magnetic Intensity Map



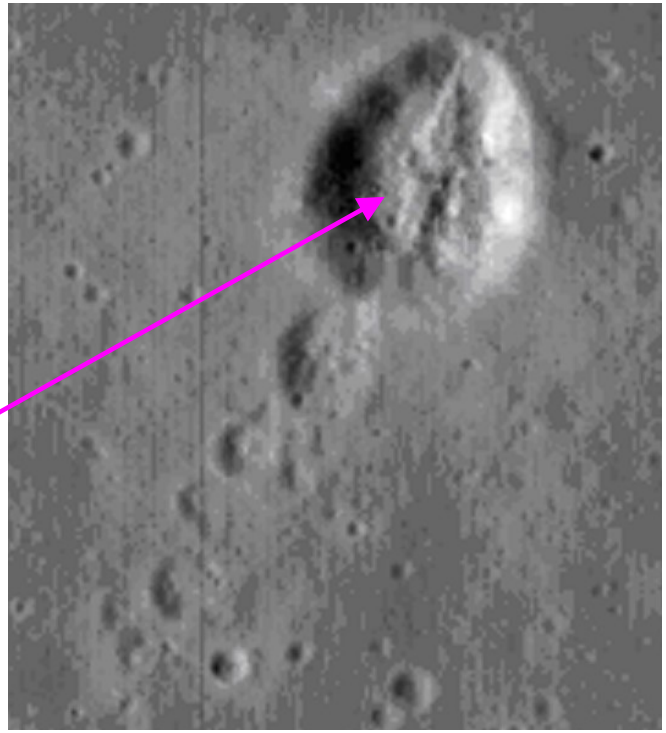

The magnetic anomaly map indicates a complex impact structure near Port Headland ( West-Australia ) which probably was formed by secondary impactors ejected by a larger impact crater further away. This impact structure probably is 253 Million years old. ( PT- Impact Event )

# Introduction : Examples of "Olique Impact Craters"



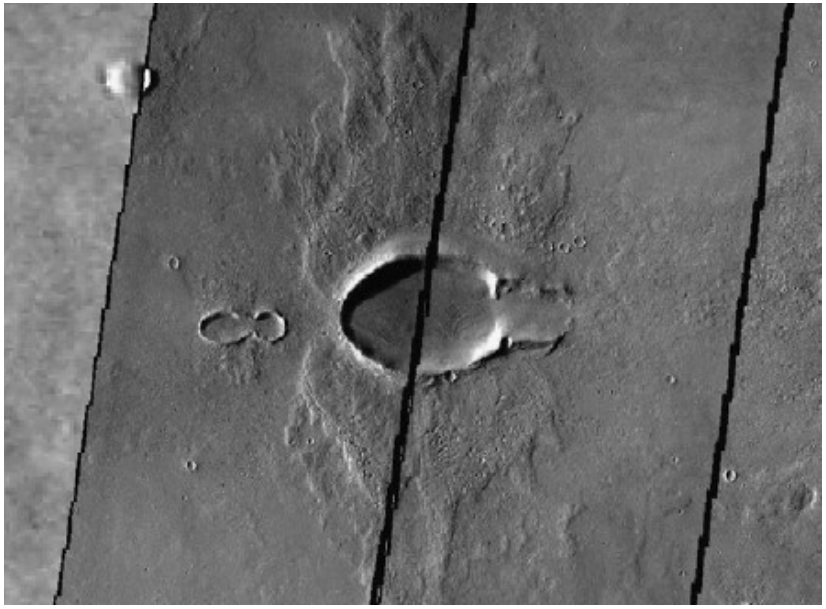


Many oblique craters show a "**center-line-structure**" which divides the crater into two equal halfs.



Not all impact craters are circular or slightly elliptical. Strongly elongate craters are found on the Moon. A few such distorted craters are present on Mars, such as the one shown below. The usual explanation is that the impacting body impacts on the surface at a very low or grazing angle, scouring out the surface material as it proceeds forward

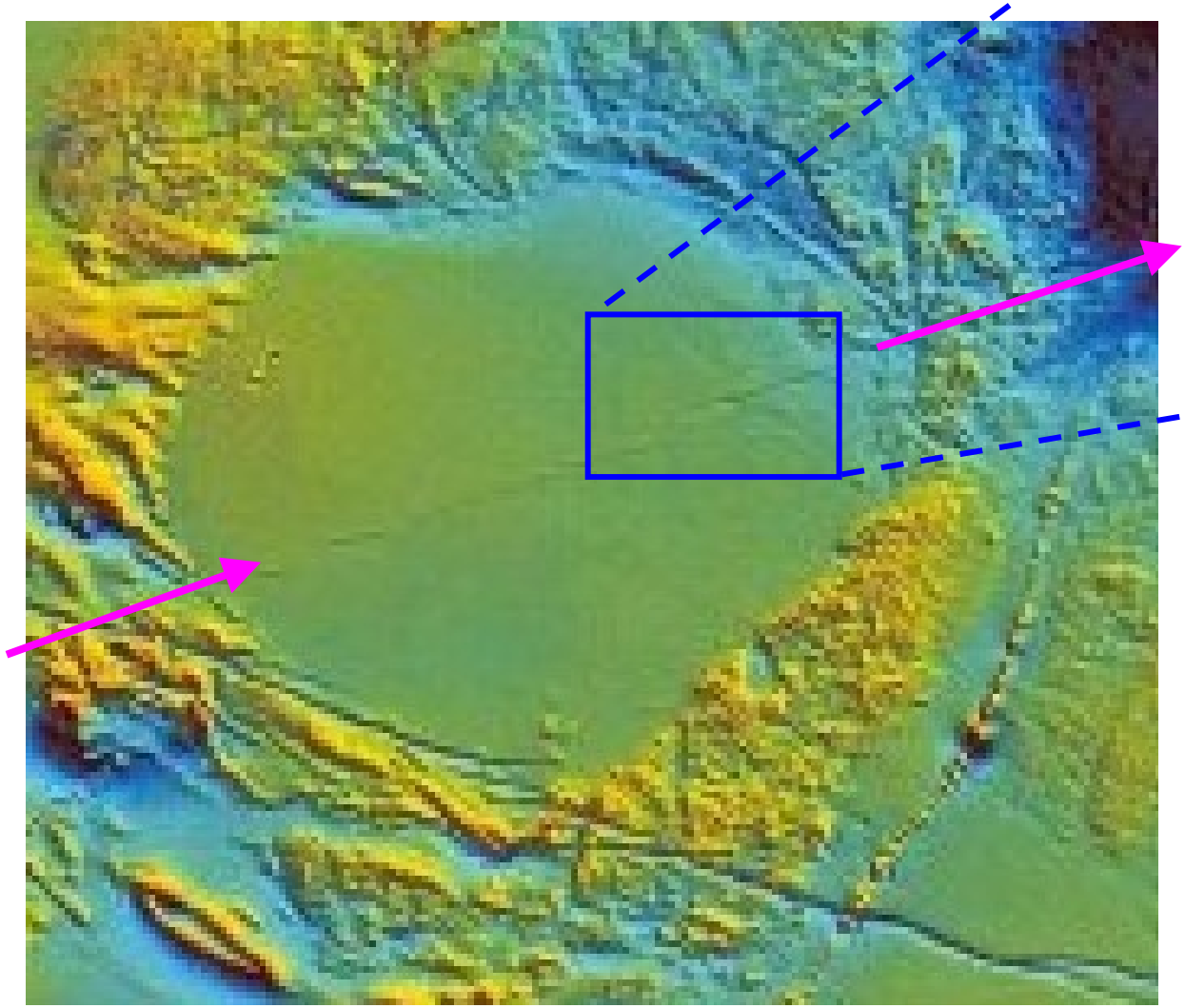
Note the drop-like shape of the impact structure

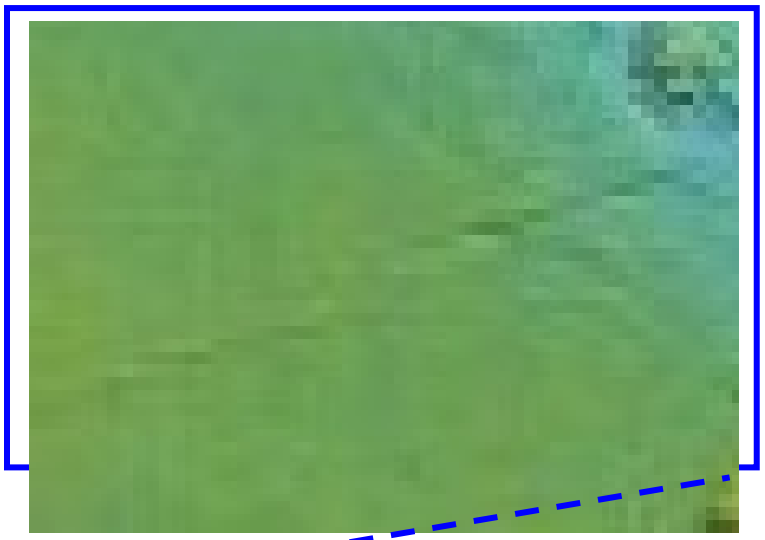


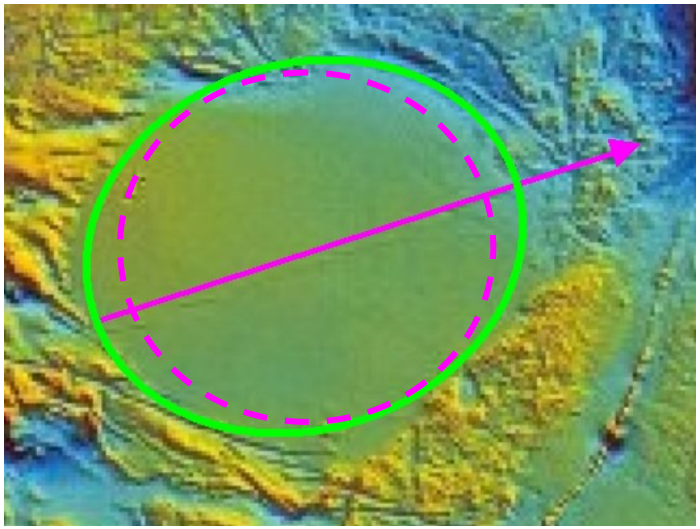
## Ø 40 x 22 km oblique Impact Crater near Port Hedland

1 ) - A clear visible center-line-structure divides the plane elliptical area near Port Hedland precisely into two halfs

2.) - The orientation of the elliptical area corresponds with the orientation of the center-line-structure

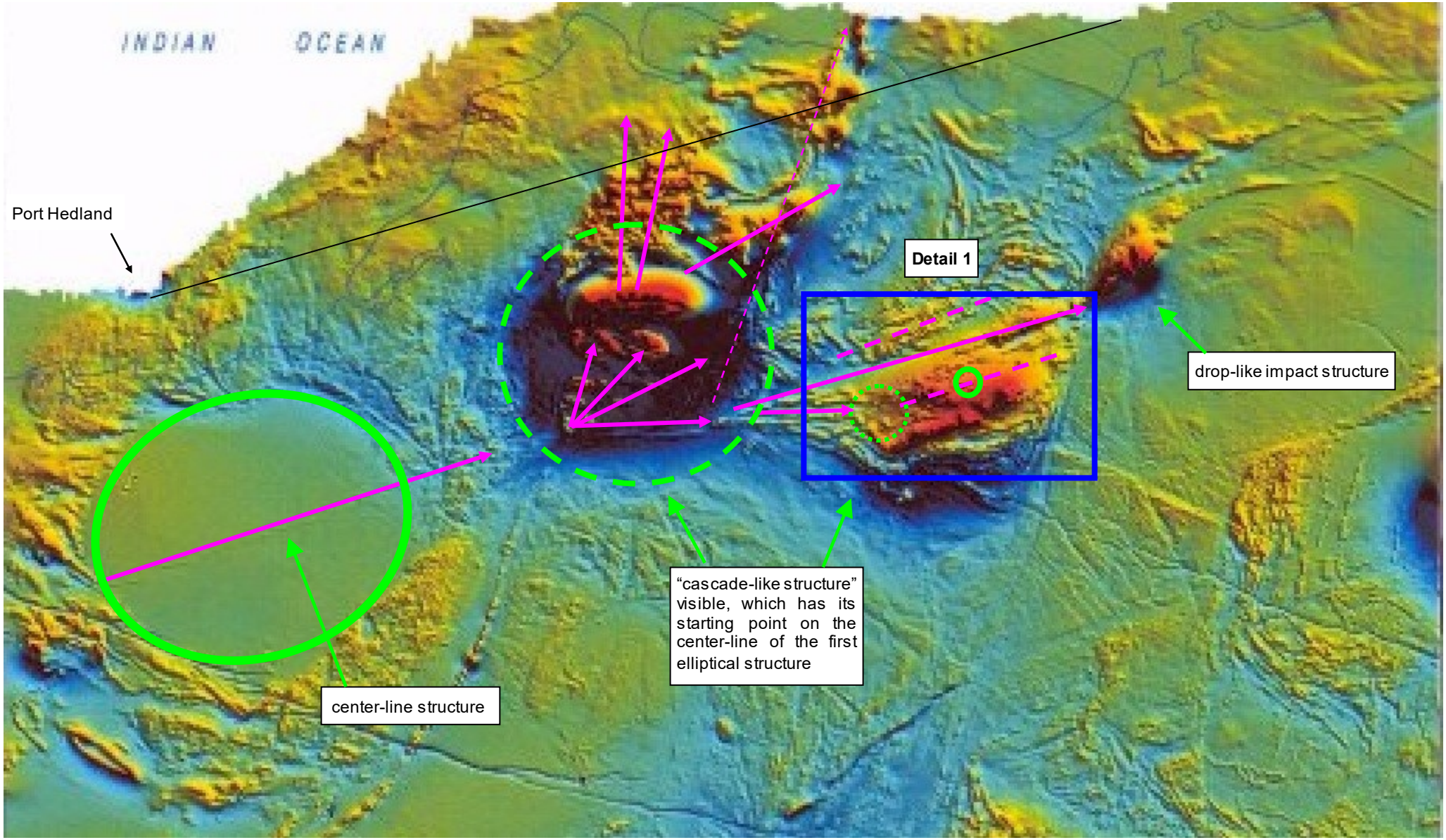






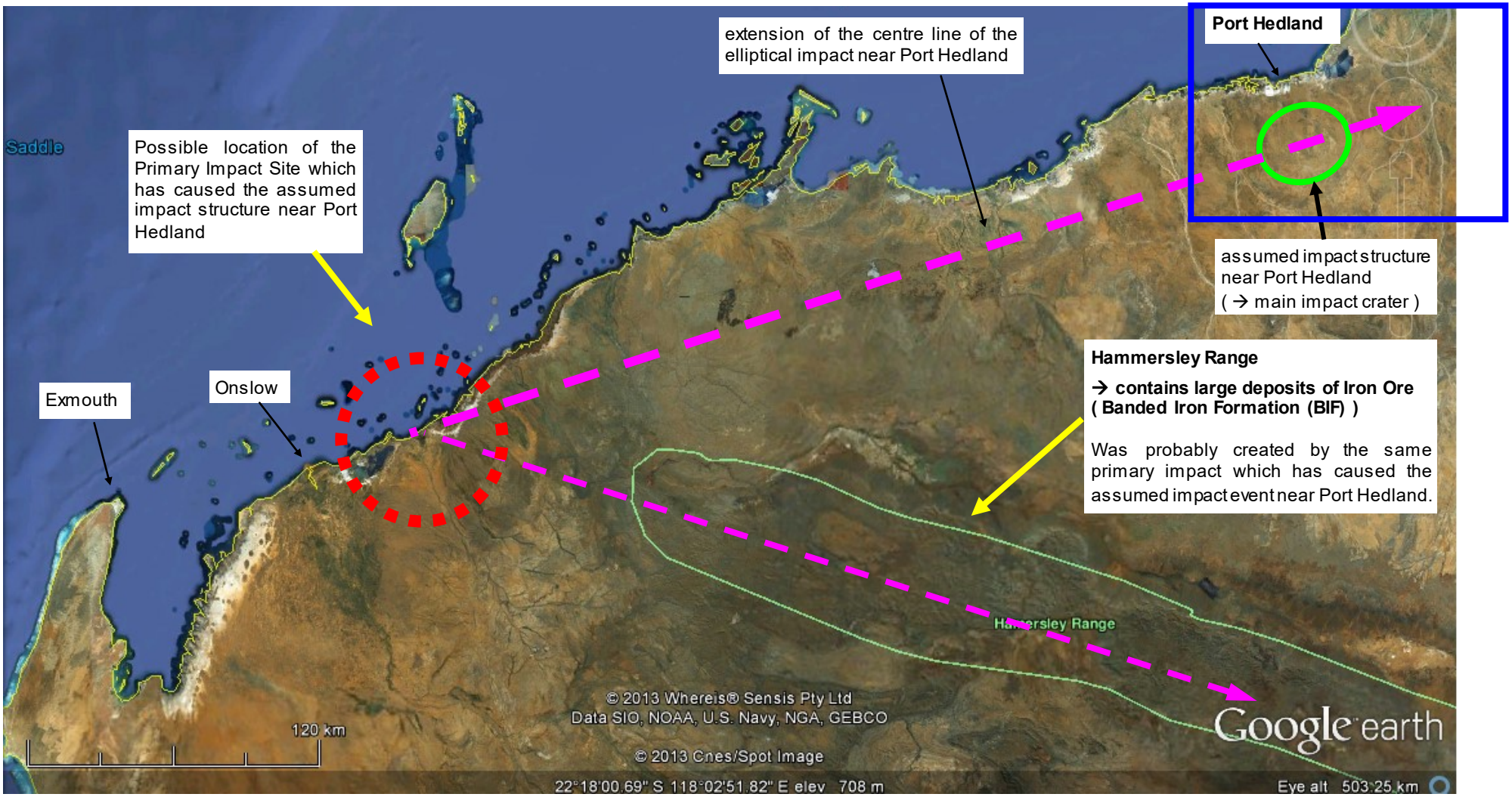
**Impact Structure near Port Hedland**

Overview of assumed Impact Event



## Possible location of the Primary Impact which caused the Impact Structure near Port Hedland

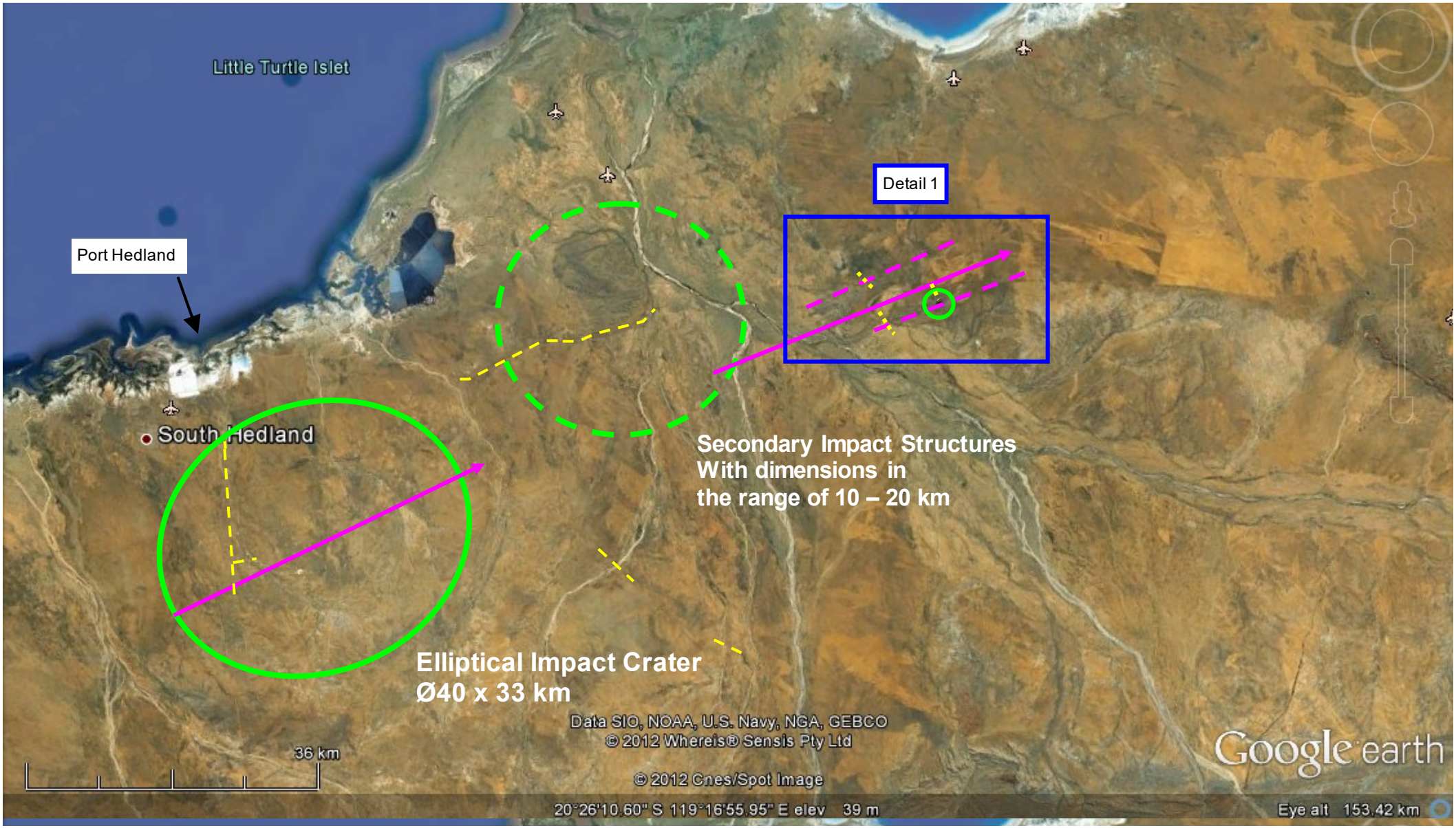
The elliptical impact crater near Port Headland and its secondary impact structures ( e.g. the Goldsworthy Iron-Ore Mine ) in all probability were caused a larger (primary) impact crater near Onslow on the NW-coast of Western Australia. This crater near Onslow may be a secondary crater itself, probably caused by the > 300 km Port Headland Crater, a large Impact Crater that was caused by the Permian-Triassic Impact in Siberia 253 Ma ago. → See **Parts 1-6 of my study** to the PT-Impact Event



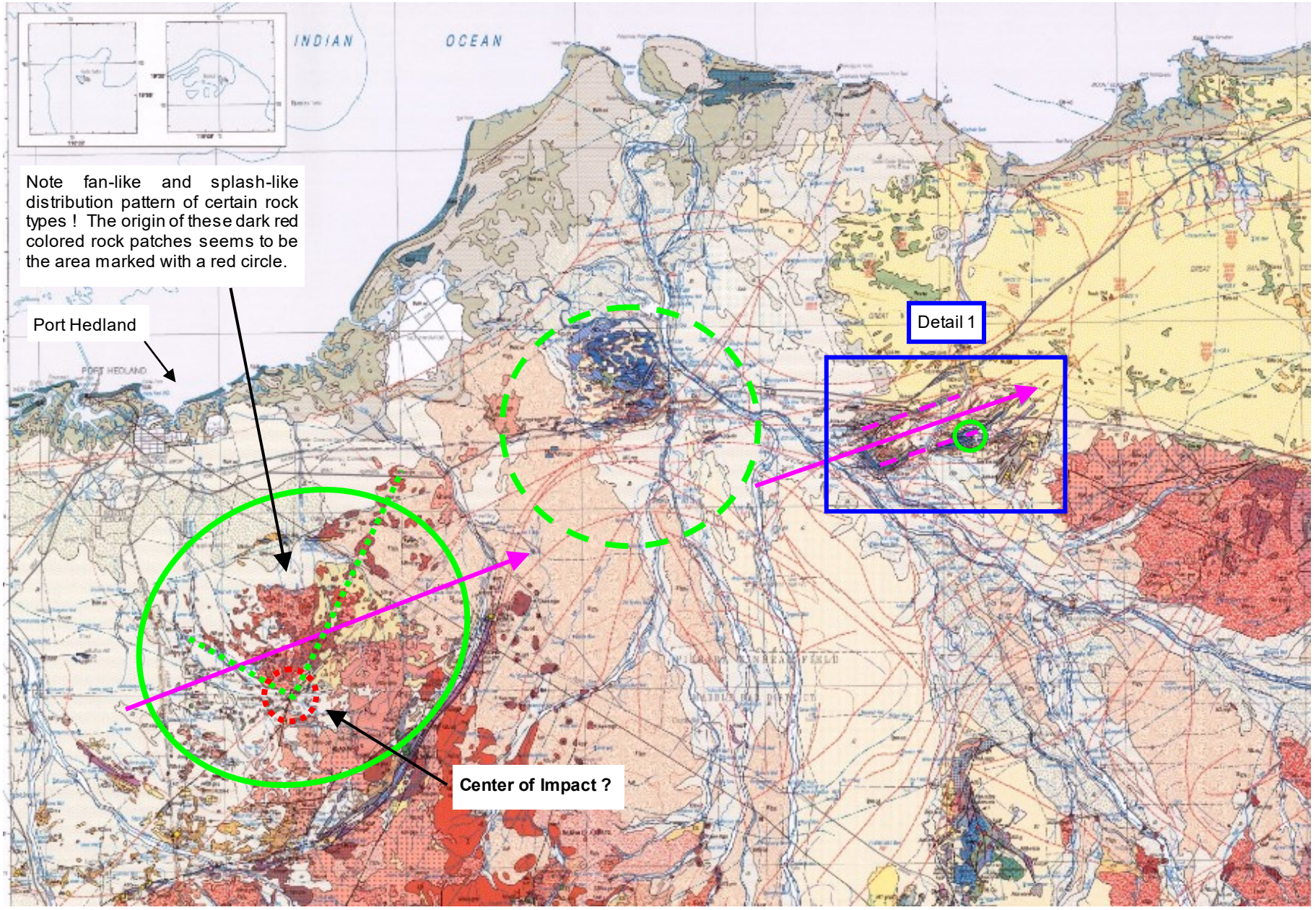
# Port Hedland Area - Satellite Image

**Port Hedland Area - Satellite Image** → Impact Structures are marked in green & pink

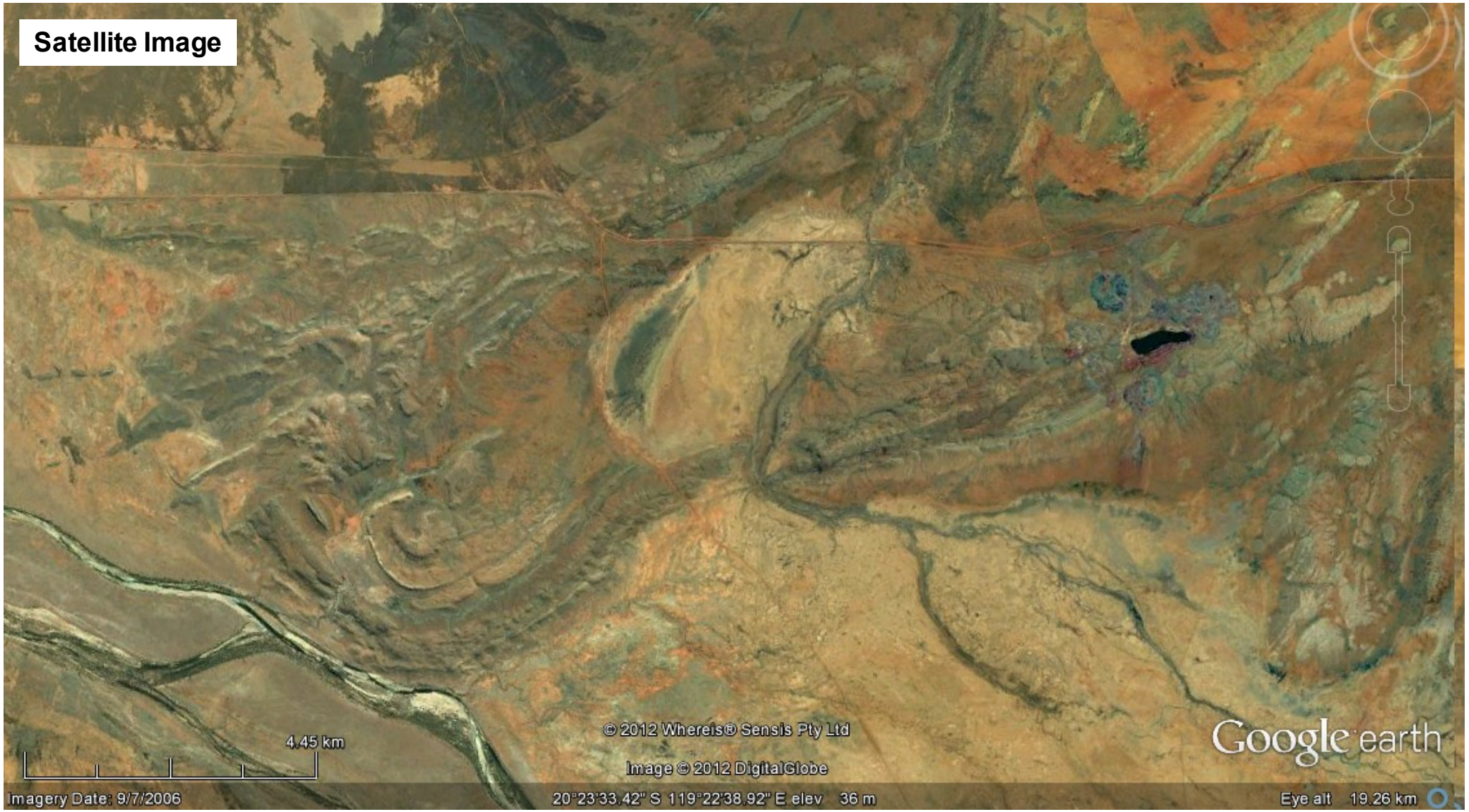
→ routes where rock samples were collected are marked with yellow lines



# Geological Map of the Impact Crater and Impact Structures near Port Hedland



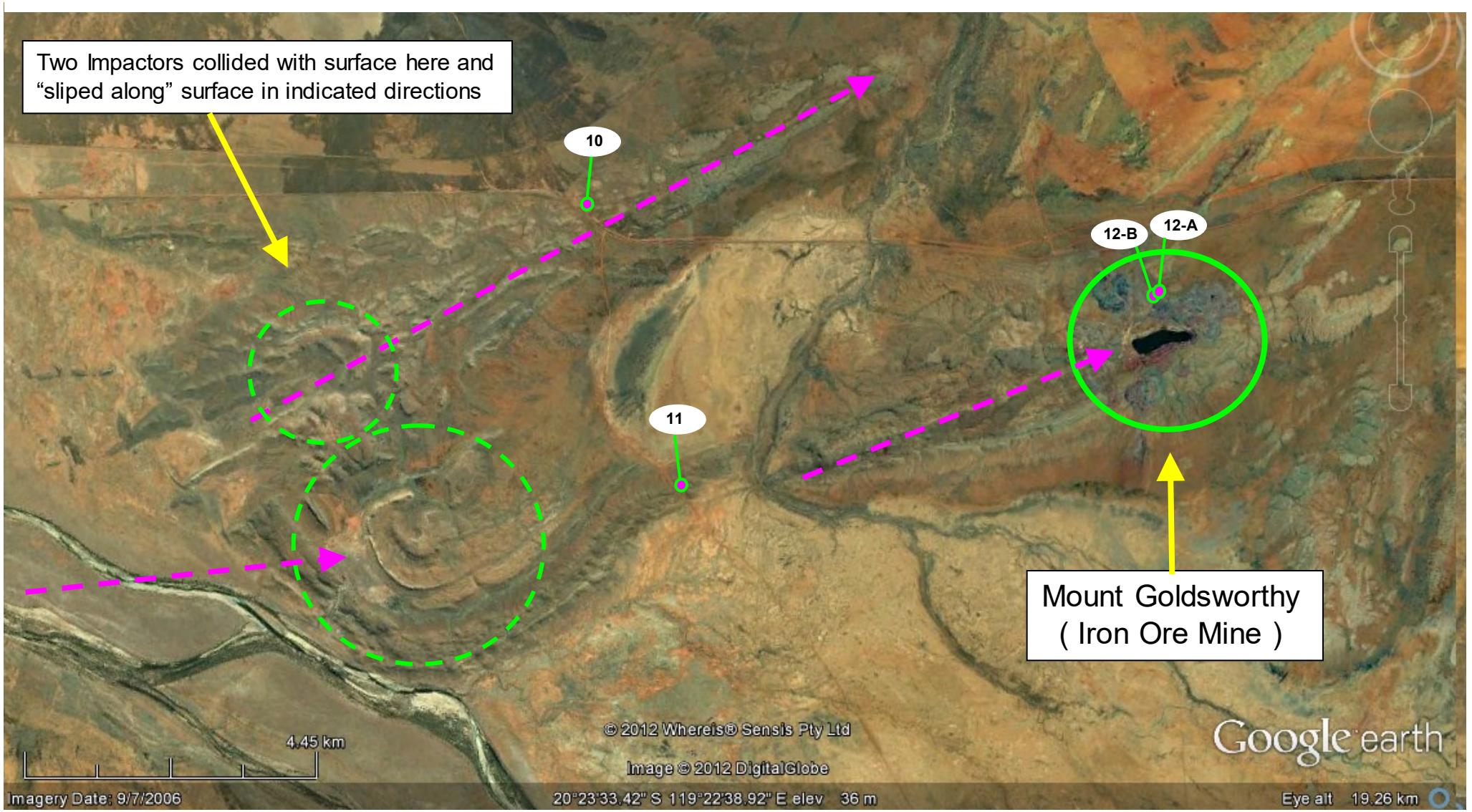
# Detail View of the eastern section of the Impact Structure ( Detail 1 )



# Detail 1 : Impact areas & Impact directions are marked on the Satellite Map

→ Also marked are the locations 10 to 12 where Rock Samples were collected.

The structures visible on the satellite image indicate that the ejecta material, which was ejected from the elliptical crater near Port Headland, impacted in the marked areas ( green circles ) and then slipped along the surface in a linear direction.
The Mount Goldsworthy Iron Ore Mine, which contained the world's richest deposits of ferrous (iron)-ore ( graded as high as 68 % ) in all probability was the final resting place of iron-rich impactor-material ( from the PT-Impact Event ) that formed these structures.



# Mount Goldsworthy - ( Iron Ore Mine )

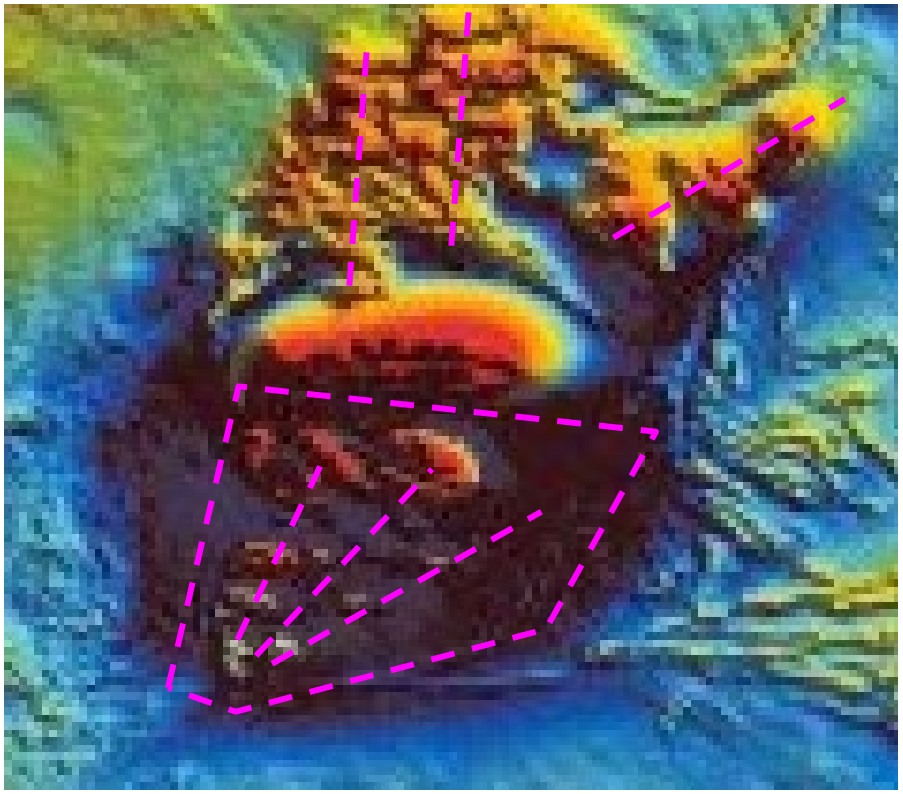
→ Before start of exploitation ( ≈ 1960 )

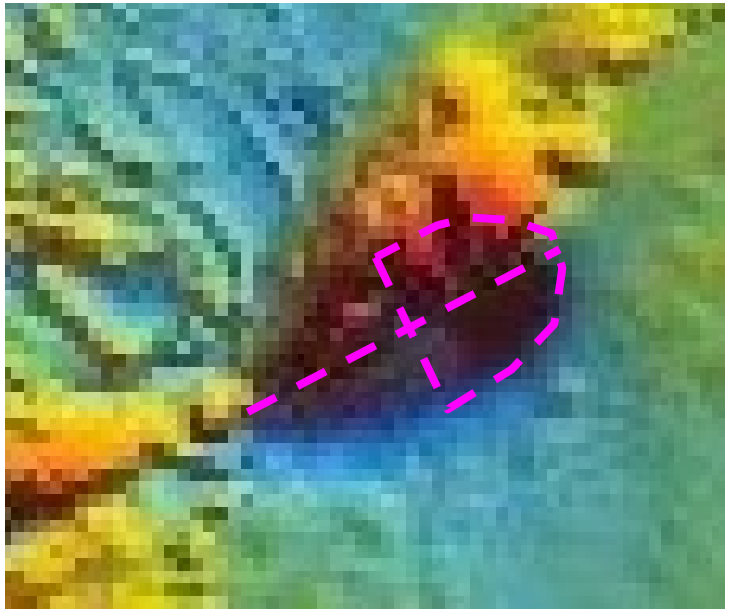
Iron-rich outcrops ( of the impact structures ) are visible on the surface !

As soon as mineral exploration began in earnest in the far northwest, it became plain that **Mt Goldsworthy held the world's richest deposits of ferrous ore**: the veins ran deep and they were graded as high as **68 per cent**. This decided the landscape's fate. In the 1960s, the Pilbara was opened up to mining; Goldsworthy was the first large-scale project. For two decades, 4000 men and women lived there, in a realm of cyclones, flash floods and blazing summer skies -- and many of them, in their imaginings, seem resident there still.

## Details of secondary Impact Structures caused by high-density ( iron-rich ) ejecta material

→ in the dark-blue ( drop-shaped ) areas high-density material impacted and descended into the ground and then later was covered by less dense ( non-magnetic ) material. The red-colored ejecta material which was caused on these two impact sites indicates that the impacting material probably was iron-rich material. The impact structure on the left shows a complex cascade-shaped structure, that resulted from this impact





## References :

**Part 5 of my Study :** Global Impact Events are the cause for Plate Tectonics and the formation of Continents and Oceans_Part 5

**Part 1 :** The 1270 X 950 km Permian-Triassic Impact Crater Caused Earth's Plate Tectonics of the Last 250 Ma

**Part 2 :** The Permian-Triassic Impact Event caused Secondary-Craters and Impact Structures in Europe, Africa and Australia

**Part 3 :** The Permian-Triassic Impact Event caused Secondary-Craters and Impact Structures in India, South-America and Australia

**Part 4 :** The Permian-Triassic Impact Event and its Importance for the World Economy and for the Exploration- and Mining-Industry


**Tectonics :**

1. W. Frisch, M. Meschede, Ronald Blakey : **Plate Tectonics** ; Germany 2011, Springer Verlag ; ISBN : 978-3-540-76503-5 , ( e-ISBN: ...-76504-2 )
2. G.R. Foulger, D-M. Jurdy : **Plates, Plumes, and Planetary Processes** ; The Geological Society of America, Special Paper 430 ; Boulder Colorado 2007 ; ISBN: 978-0-8137-2430-0
3. P. Kearey, F.J. Vine : **Global Tectonics** , England 1996, Blackwell Science Ltd. , ISBN : 0-86542-924-3

**Impact Cratering :**

4. C. Koeberl, F. Martinez-Ruiz : **Impact Markers in the Stratigraphic Record** 2003 ; Springer Verlag ; ISBN : 3-540-00630-3
5. G. R. Osinski, E. Pierazzo : **Impact Cratering** ; USA 2013, Wiley-Blackwell Publication ; ISBN : 978-1-4051-9829-5
   → companian website of book : www.wiley.com/go/osinski/impactcratering
6. W.U. Reimold, R.L. Gibson : **Meteorite Impact** ; Council for Geoscience, Germany 2009, Springer Verlag
7. R.L. Gibson, W.U. Reimold : **Large Meteorite Impacts and Planetary Evolution IV** ; The Geological Society of America, Special Paper 465 Boulder Colorado 2010 ; ISBN: 978-0-8137-2465-2


## Interesting Online Documents & Websites :


1.) Introduction : **Impact Metamorphism** , by Dr. Ludovic Ferriere
   → http://www.meteorimpactonearth.com/impactmeta.html

2.) **Numerical modelling of basin-scale impact crater formation**; R.W.K. Potter
   → http://www.lpi.usra.edu/lpi/potter/publications/RossThesis.pdf, **see also**: Orientale impact

3.) **Cycles in fossil diversity** : R.A. Rohde, R.A. Muller, 2005, www.nature.com
   → http://muller.lbl.gov/papers/Rohde-Muller-Nature.pdf → see Introduction in my study

4.) **Asteroid/Comet Impact Craters and Mass Extinctions** , Michael Paine
   → http://users.tpg.com.au/users/tps-seti/crater.html

5.) **A Breakup of Pangaea and plate kinematics of the central Atlantic and Atlas regions**, A.Schettino, E.Turco → http://gji.oxfordjournals.org/content/178/2/1078.full