

STROKOVNO IZOBRAŽEVANJE NA TEMO / *EVENTO INFORMATIVO -DIVULGATIVO*

**VAROVANJE VIROV PITNE VODE
V IZREDNIH DOGODKIH**

Osnove hidrologije, krasoslovja in prostorske analize

*TUTELA DELLE RISORSE DI ACQUA POTABILE IN SITUAZIONI DI EMERGENZA
Basi di idrogeologia, carsologia e analisi territoriale*

**IDROGEOLOGIA DELLA PIANURA ISONTINA/
HIDROGEOLOGIJA SOŠKE NIŽINE**

FRANCO CUCCHI

Dipartimento di Matematica e Geoscienze,
Università di Trieste

Hotel Perla, Nova Gorica, 17.3.2014



UNIVERSITÀ
DEGLI STUDI DI TRIESTE



2007-2013

cooperazione territoriale europea
programma per la cooperazione
transfrontaliera

Italia-Slovenia

evropsko teritorialno sodelovanje
program čezmejnega sodelovanja

Slovenija-Italija



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Progetto cofinanziato dal Fondo europeo di
sviluppo regionale

Projekt sofinancira Evropski sklad
za regionalni razvoj

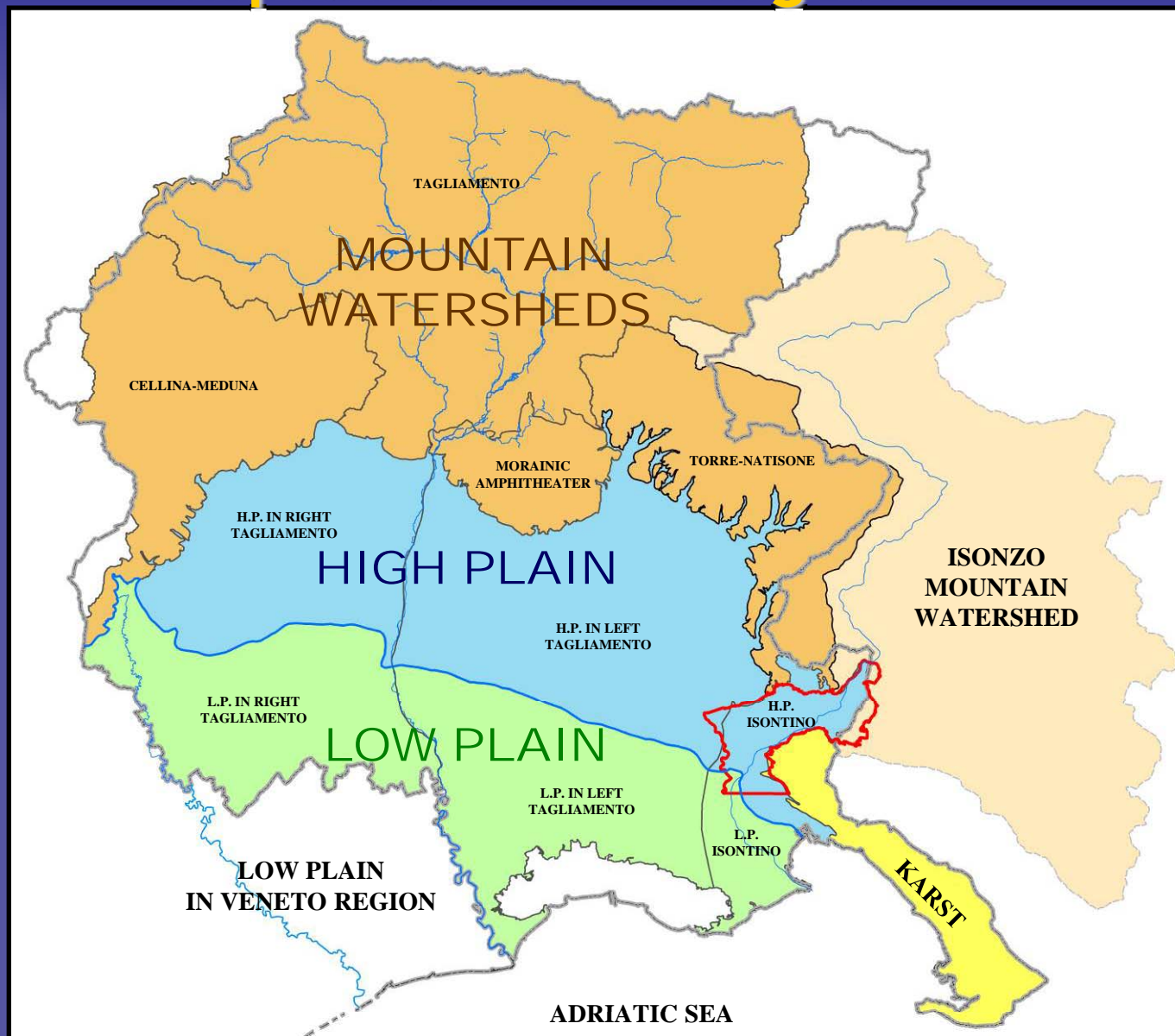
Inquadramento geologico

- La Pianura Isontina rappresenta il lembo più orientale della Pianura Friulana e presenta analoghe caratteristiche genetiche ed idrogeologiche
- È costituita da depositi alluvionali quaternari dei corsi d'acqua Torre, Judrio, Versa e Isonzo



- Soška ravnica predstavlja najbolj vzhodni rob Furlanije in ima podobne genetske in hidrogeološke značilnosti
- Skoraj v celoti jo gradijo kvartarni aluvialni sedimenti rek Ter, Idrija, Versa in Soča

Inquadramento fisiografico



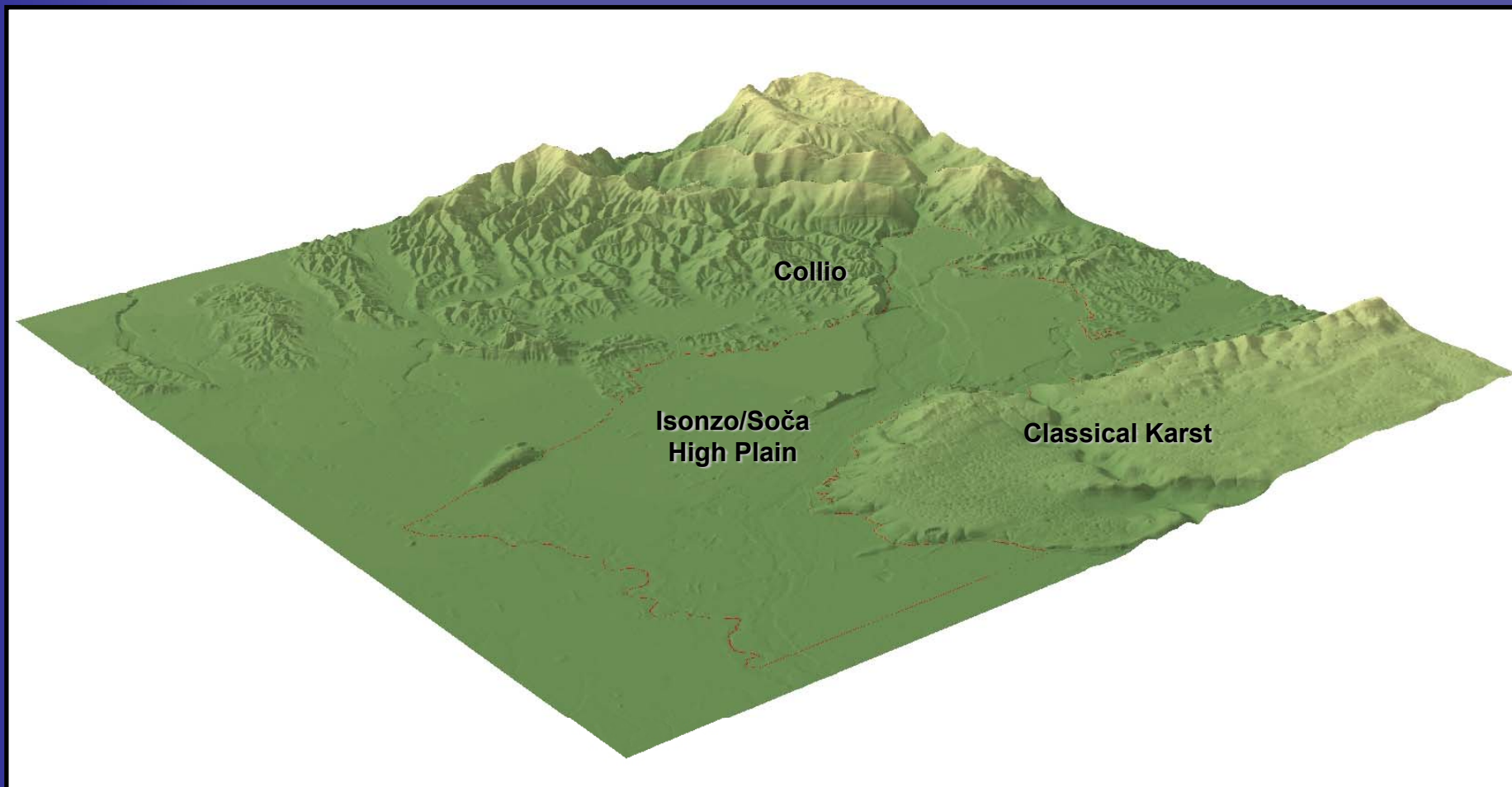
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Evento informativo-divulgativo/Strokovno izobraževanje

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Modello Digitale del Terreno (DTM)



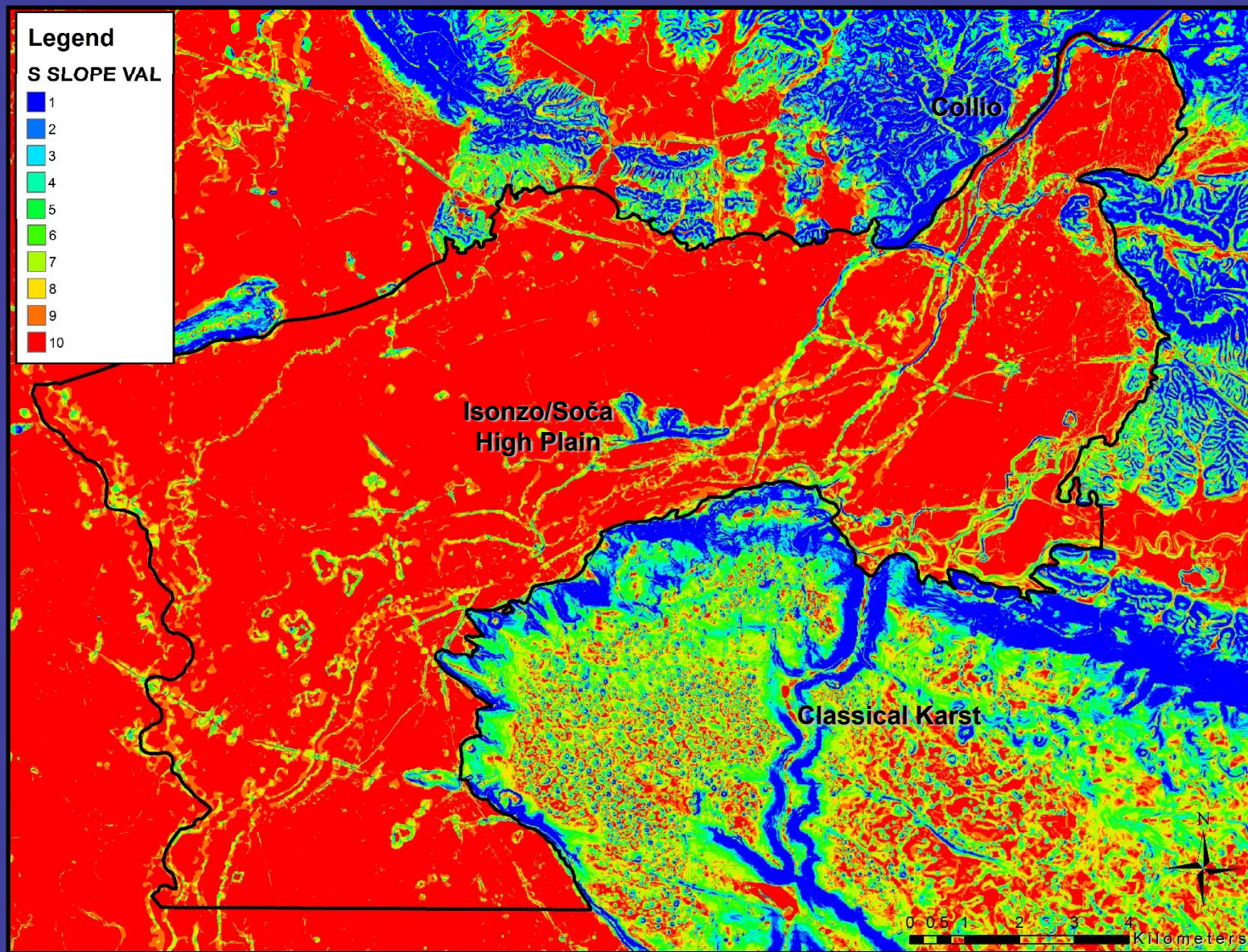
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Carta dell'acclività



VAROVANJE VIROV PITNE VODE V IZREDNIH DOGODKIH / VODE SOŠKEGA ALUVIJA

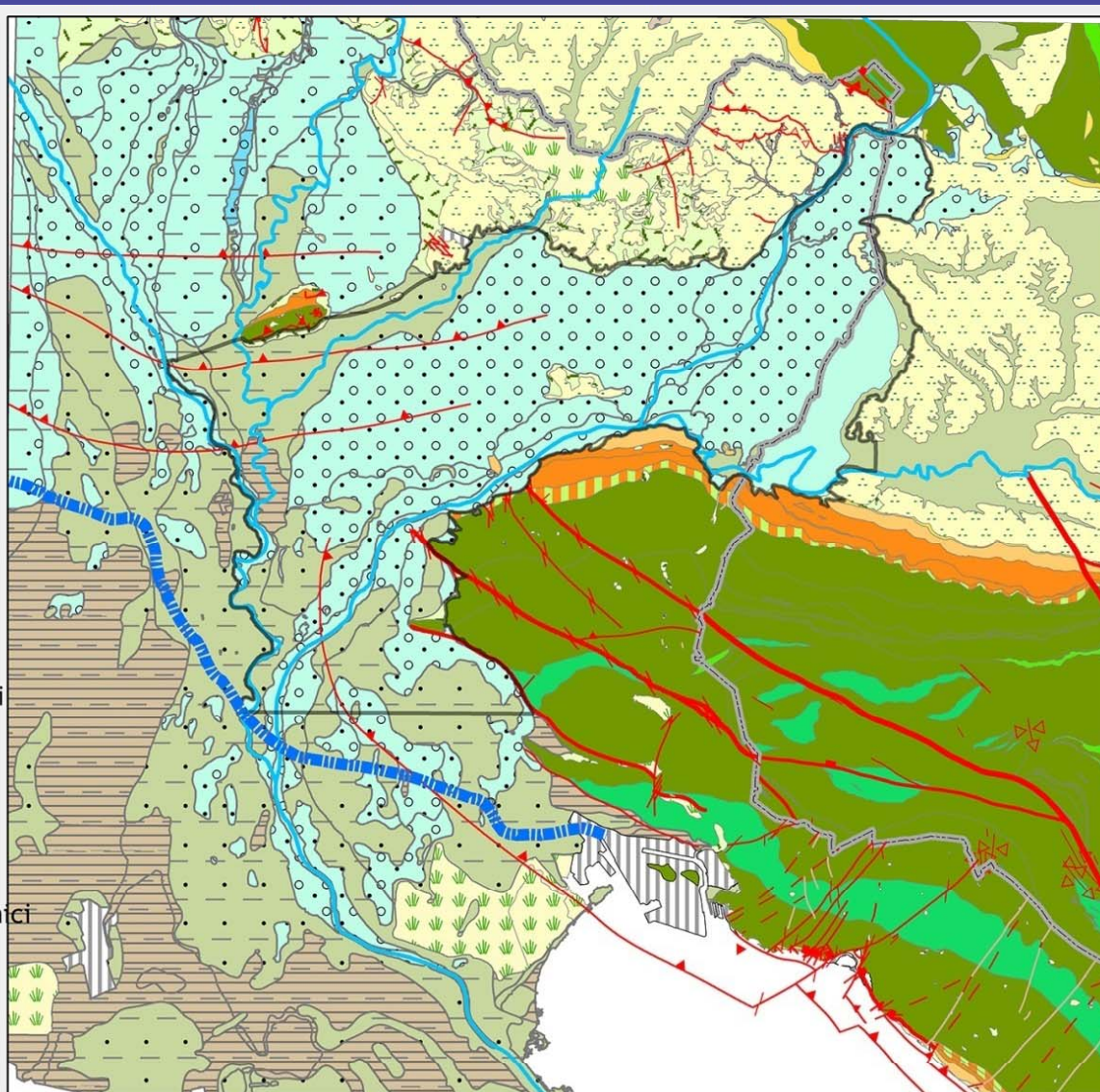
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Carta geologica della Pianura Isontina

-  Linea delle Risorgive
-  depositi antropici
-  depositi alluvio-eluvio-colluviali
-  depositi palustri
-  ghiaie
-  ghiaie e sabbie
-  ghiaie sabbie e argille
-  ghiaie e sabbie cementate
-  argille
-  argille sabbie e ghiaie
-  sabbie
-  sabbie e argille
-  depositi di versante
-  Breccie e conglomerati quaternari
-  Flysch
-  Calcari Eocenici (Alv.&Numm.)
-  Calcari Paleocenici
-  Calcari tardo-Cretacici e Paleocenici
-  Calcari Cretacici
-  Dolomie Cretaciche
-  Calcari Cretacici tabulari



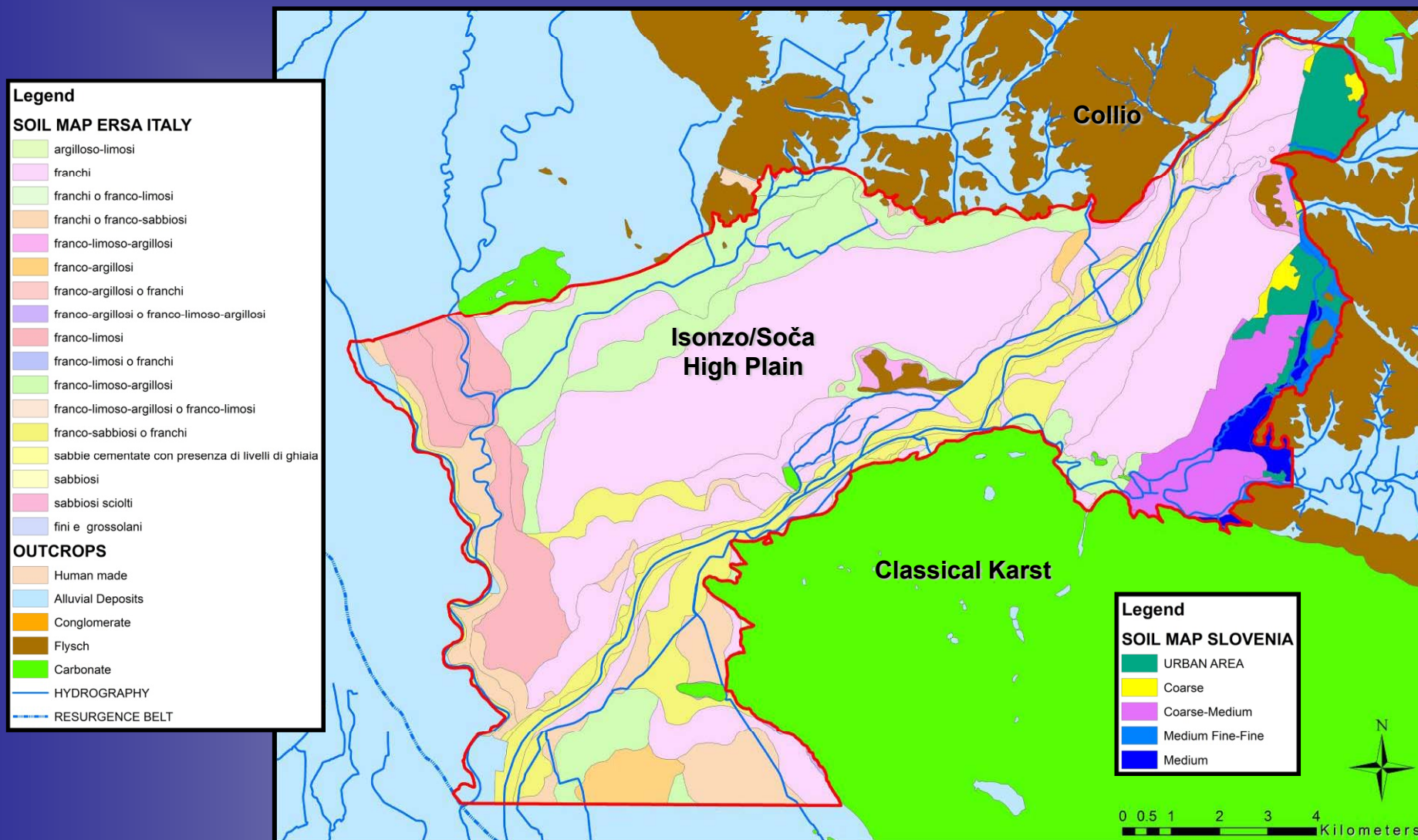
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Carta dei suoli ITA/SLO



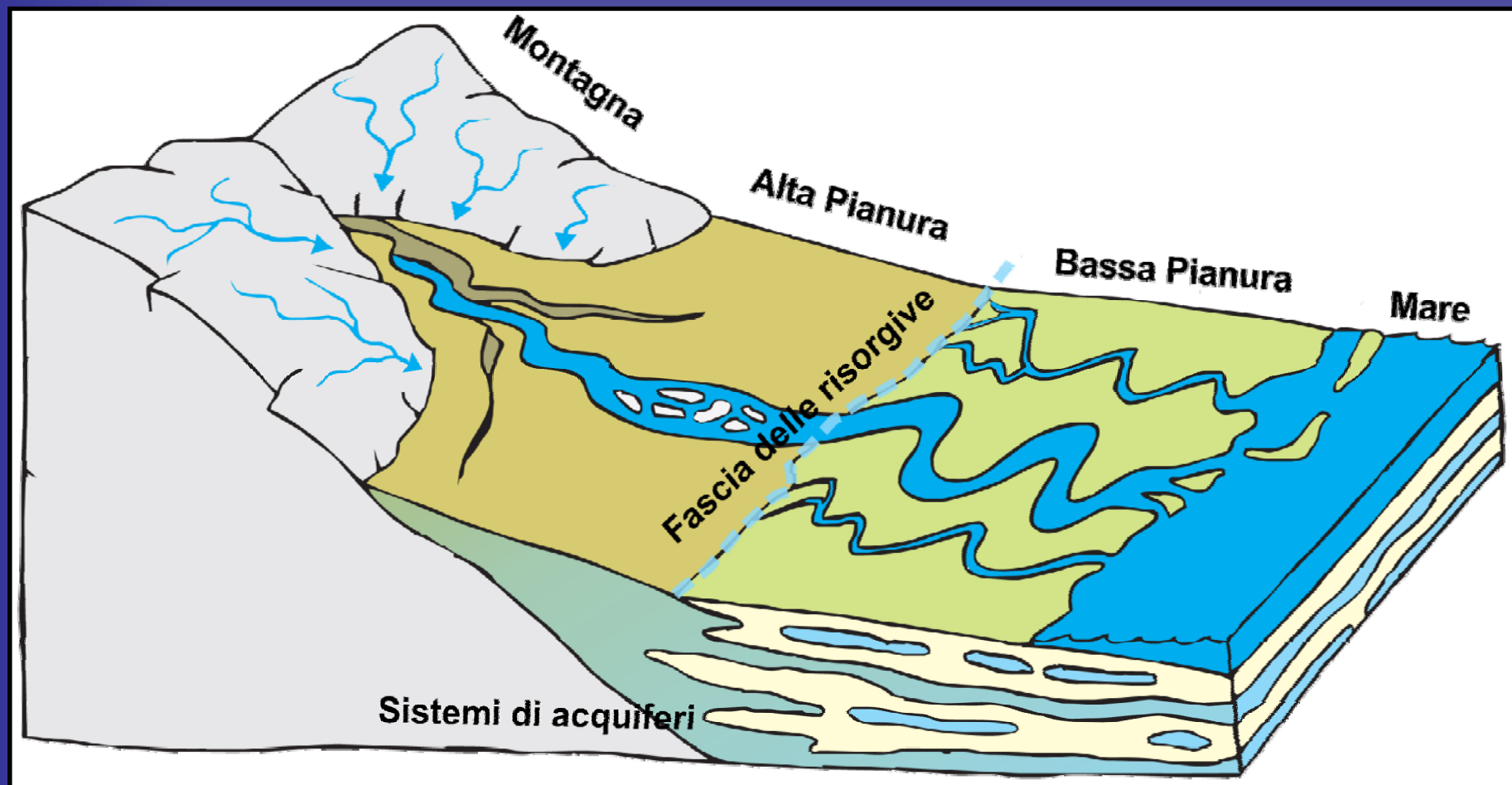
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Inquadramento idrogeologico



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Il Progetto GIS e il Geodatabase

INTERREG.mxd - ArcMap - ArcInfo

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

1:131562

Snapping

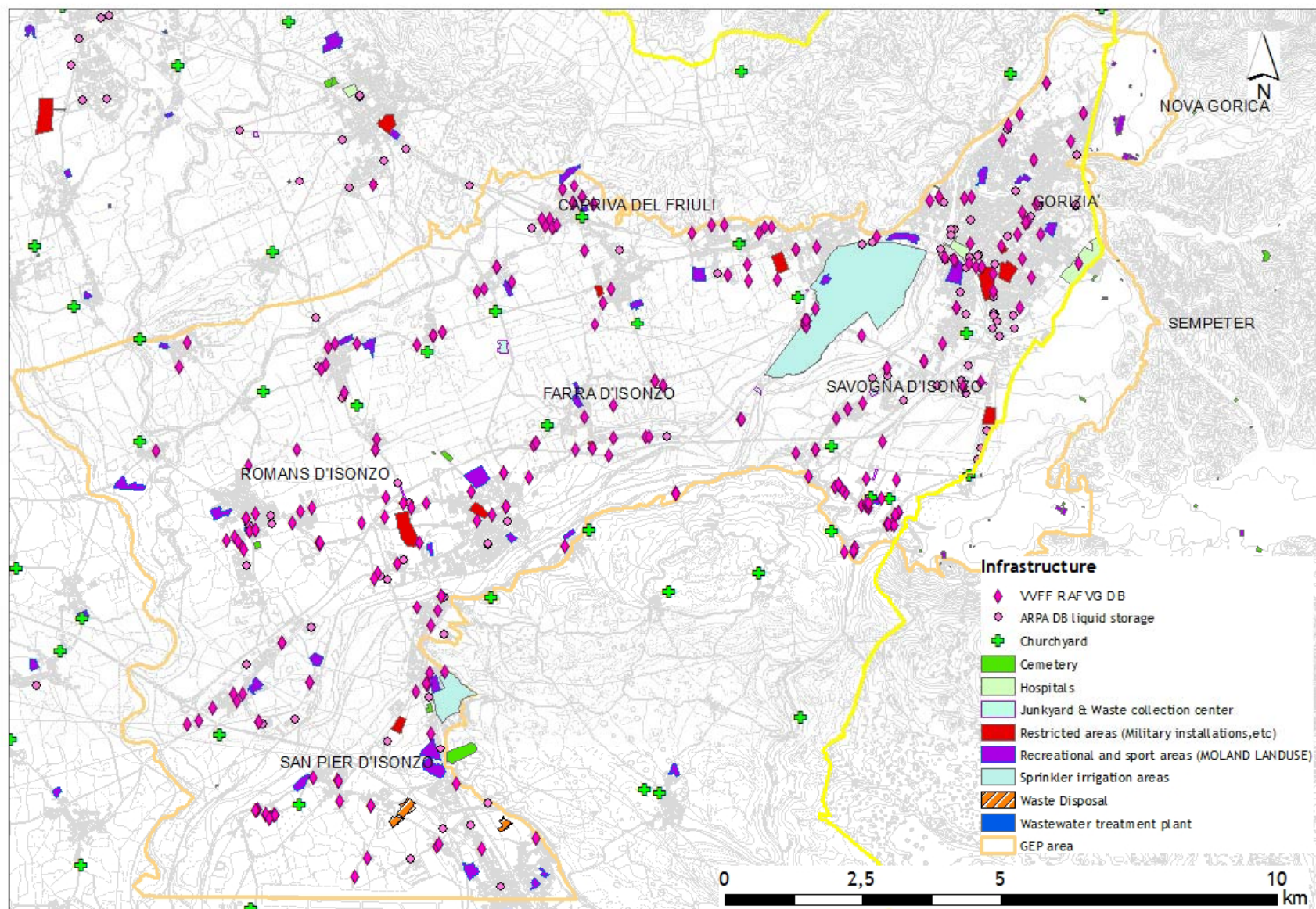
Editor 76% Page Text

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 - OTHER_ITEMS
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 - BEDROCK
 - S_SOGGIACENZA
 - I_INFILTRAZIONE
 - N_NON SATURO
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 - flow
 - HYDROKARST_AREA
 - ISONZO_PLAIN
 - VARIOUS_ITEMS_GDB
 - FAUNA_HK_NIB
 - GEP_WATER_SOURCES_SLO

358779.21 5096812.548 Meters

GIS dei Centri di Pericolo: infrastrutture



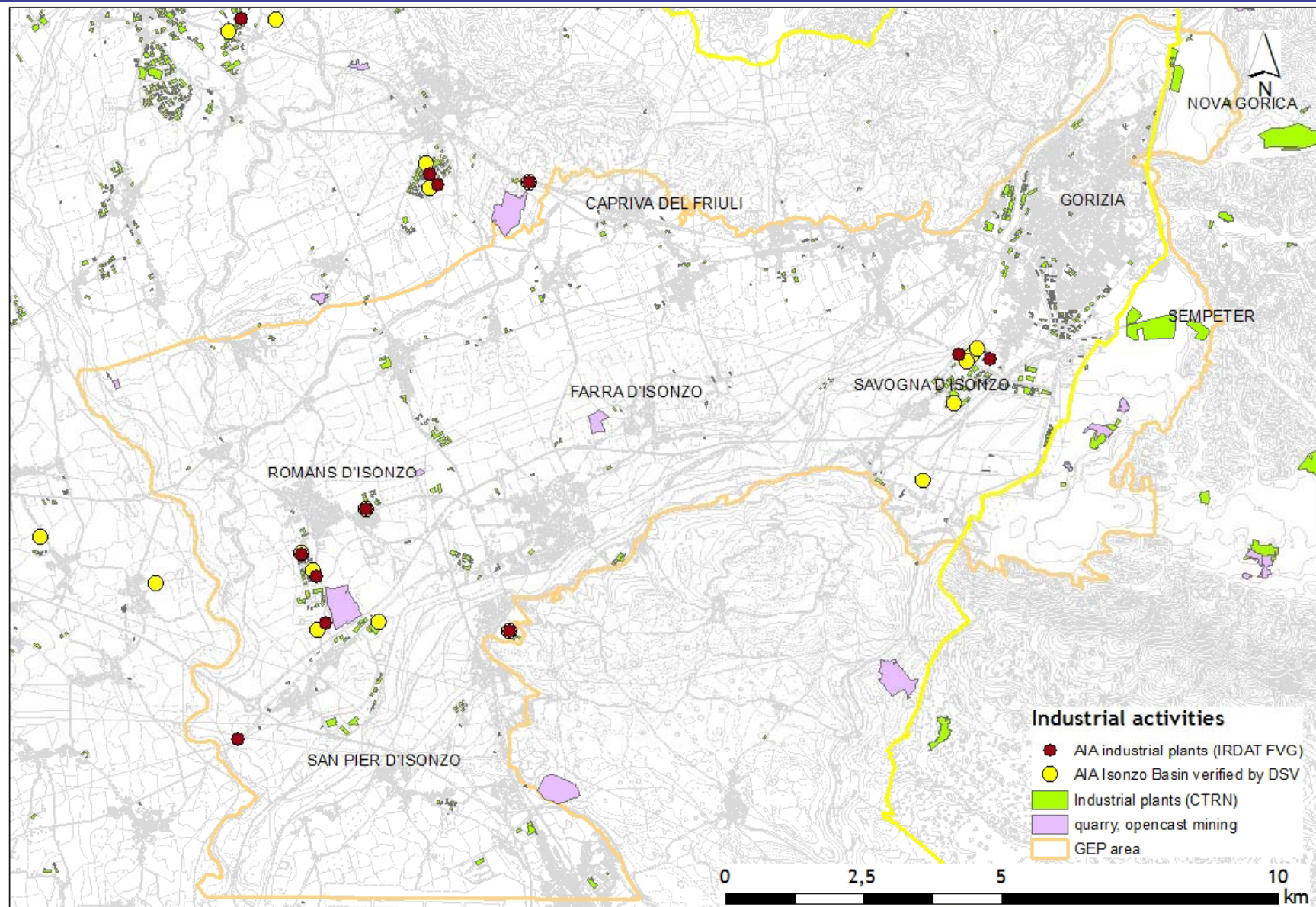
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GIS dei Centri di Pericolo: attività industriali



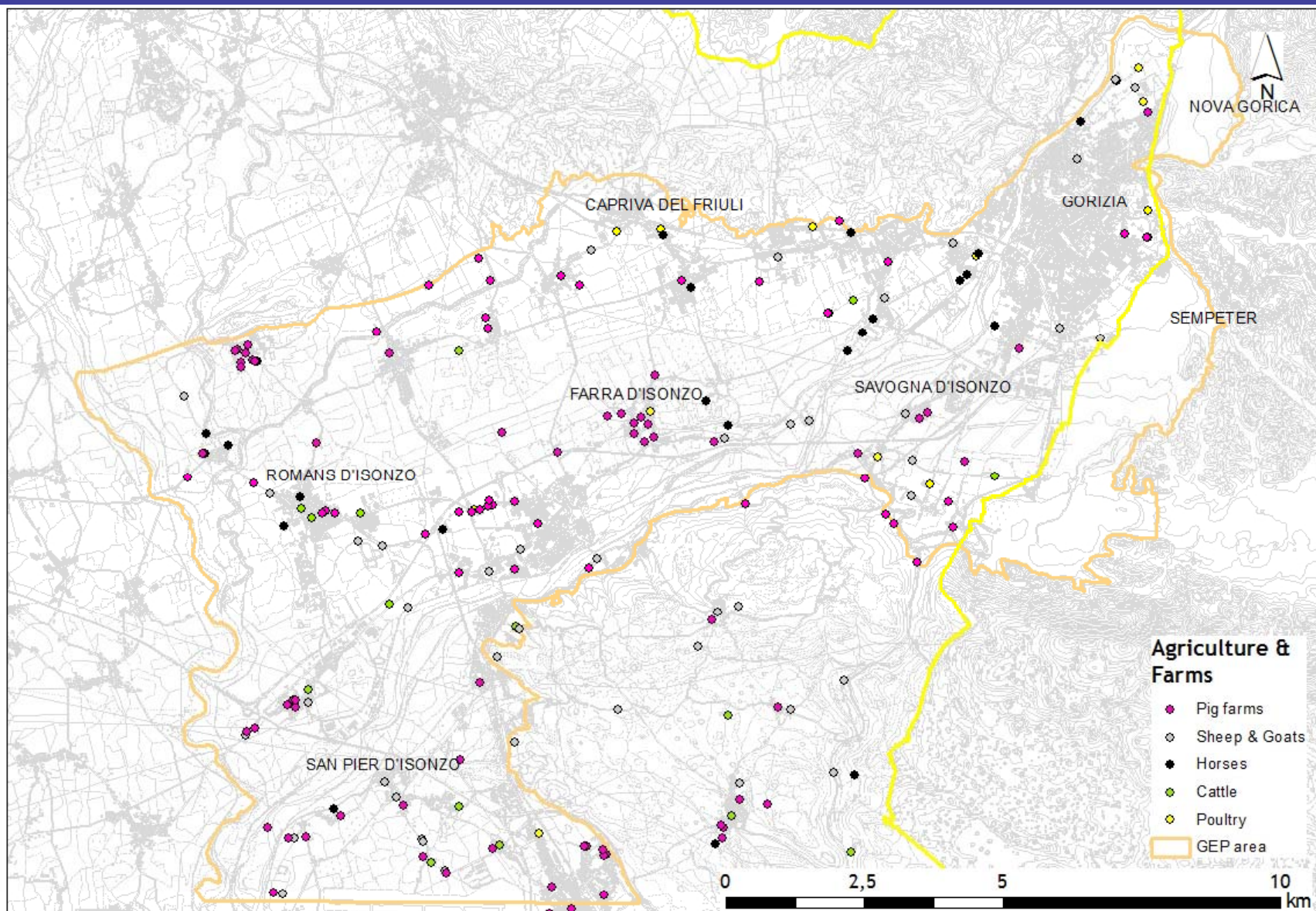
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Evento informativo-divulgativo/Strokovno izobraževanje

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GIS dei Centri di Pericolo: allevamenti



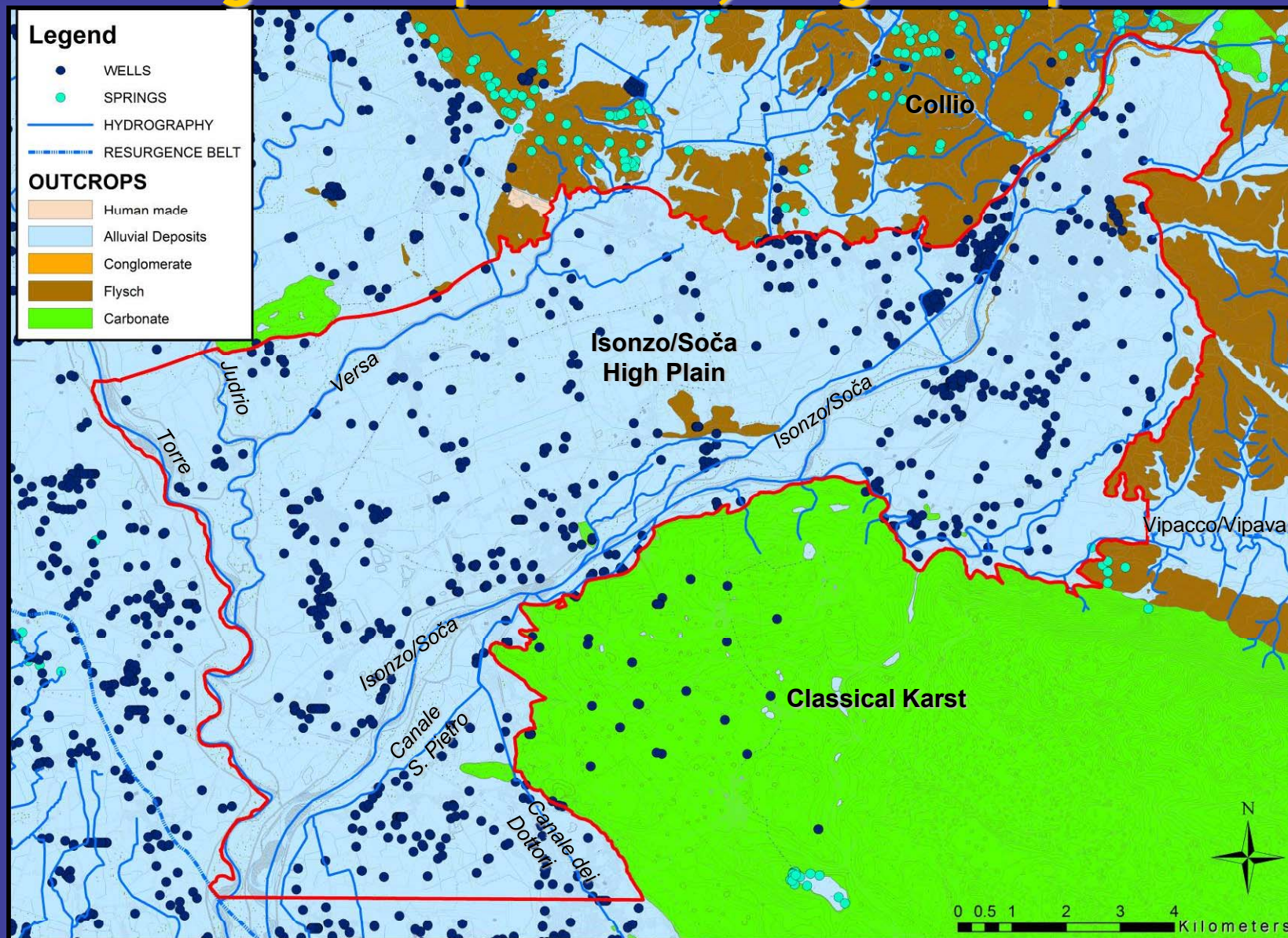
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Evento informativo-divulgativo/Strokovno izobraževanje

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Idrografia superficiale, sorgenti e pozzi



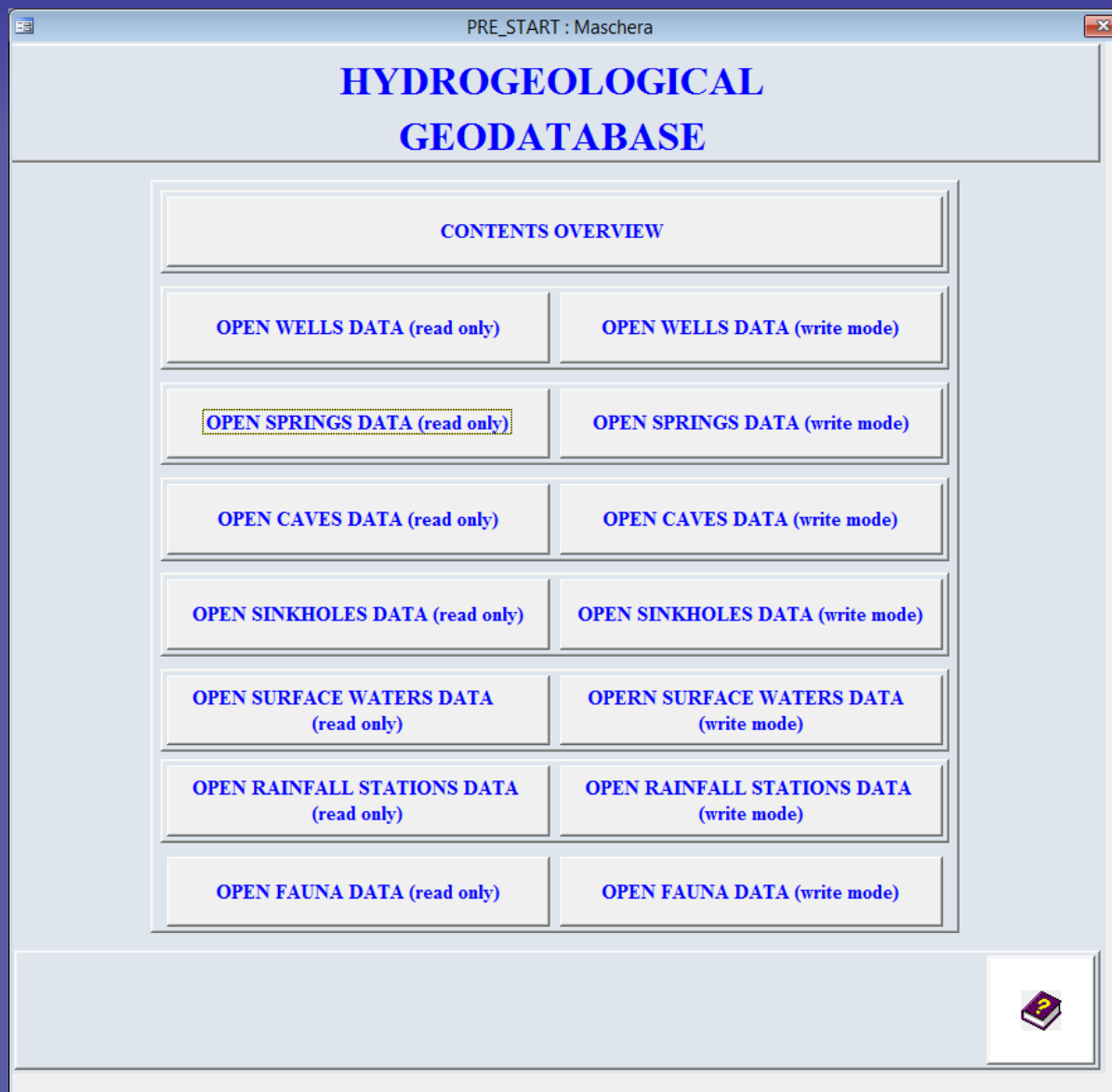
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Il Geodatabase idrogeologico



VAROVANJE VIROV PITNE VODE V IZREDNIH DOGODKIH / VODE SOŠKEGA ALUVIJA

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Il Geodatabase idrogeologico

WELLS

WELL ID **42493** PROJECT **ASTIS-GEP** MATCHING VERIFIED

LOCATION AND MAIN DATA

COORDINATES

Longitude WGS84 UTM ZONE 33N [m] 380613.6929

Latitude WGS84 UTM ZONE 33N [m] 5074726.4238

Accuracy Bibliography 1:5000

Original Coordinates UTM_Gauss_Boaga

OWNER AND USES

CARTOGRAPHIC LOCATION

TAV Code 088_SO

Section TURRIACO 088140

Flement BEGLIANO 088142

DRILLING

ADMINISTRATIVE LOCATION

Nation ITALY ITALY

Region Friuli Venezia Giulia Friuli Venezia Giulia

Province GO GO

Municipality SAN CANZIAN D'ISONZO SAN CANZIAN D'ISONZO

ISTAT Code 031018 031018

ATO ORIENTALE-GORIZIA ORIENTALE-GORIZIA

Location from Source and GIS Equal

SCREENS AND LITHOLOGY

ELEVATION

Elevation Source [m] a.s.l. 8.3

Elevation GIS [m] a.s.l. 8.5

Elev. Difference [m] 0.2

Elev. Diff. Note <|30| m

Head [m] a.g.l. 0.0 s.l. 8.5

DEPTH

Total Depth [m] a.g.l. 70.1

Base Depth [m] a.s.l. -61.6

BIBLIOGRAPHY

IMAGES

AQUIFERS SURVEY

WELL TYPE, NAME, SITE, ACCESSIBILITY

Well Type Piezometer

Well Name Begliano

Synonym

Site-Village BEGLIANO, VIA S.CANZIAN, FERROVIA

Address VIA S. CANZIAN

Annotation piezometro ACEGAS n. 40

CADASTRE

Section

Sheet n° Parcel n°

WATERSHEDS (from GIS Watersheds Feature Class)

| Order 1 | Order 2 | Order 3 | Order 4 | Order 5 | Order 6 | Mechanical Drainage |
|---------------------------|---------|---------|---------|---------|---------|---------------------|
| ID 17 Order GOLFO PANZANO | - | - | - | - | - | - |

RIVER (from GIS Hydrography Feature Class)

| ID | Name | CTRN Name | RD Name | Forestate Name | Other Name |
|----|------|-----------|---------|----------------|------------|
| | | | | | |

DATA CORRECTION AND REMARKS

Data Correction

Remarks Elevation Levelled

DATA SOURCES

| Source | ID Original Source | Code Source | Code Name | Duplicated Code |
|-----------------------|--------------------|-------------|-----------------------|-----------------|
| SIT_CGT_SITI | 43140 | 43140 | CUP_CODE_SIT_CGT_SITI | 1 |
| RETE_FREATIMETRICA_SI | 0253 | 0253 | RETE_FREATIMETRICA_SI | |
| PERF_DEN_SI | 45465 | 45465 | PERF_DEN_SI | |
| CGT | 2_088142 | 2_088142 | CGT | |
| CATASTO_REG | 1560003 | 1560003 | COD_CATASTO_REG | 1 |

DATA ENTRY

Added on 22/02/2014 15.02.44

by Francesco Treu

Updated on 22/02/2014 15.02.45

by Francesco Treu

Record: 1 di 5

Record: 1 di 1 (Filtrati)

CONVERSION TOOLS

POMA

FILTERS

REMOVE ALL FILTERS

SOURCE

SUBSOURCE

GOV GIS

PHYSIOGRAPHIC

AQUIFER TYPE

QUERIES

ADD SCREENS LITHOLOGY

CALCULATE HYDRO CHEMICAL PARAMETERS

ALL OTHERS QUERIES

CALCULATE sea level

CREATE NEW QUERY

UPDATE PATH

Il Geodatabase idrogeologico

WELLS
WELL ID **42493** PROJECT **ASTIS-GEP** MATCHING VERIFIED

LOCATION AND MAIN DATA
OWNER AND USES
DRILLING
GEOLITHOLOGY
SCREENS AND LITHOLOGY
BIBLIOGRAPHY
IMAGES
AQUIFERS SURVEY

| TOP AND BASE | | | LITHOLOGIC DATA | | | | GEOLOGIC DATA | | | |
|-------------------------|--------|-----------|-----------------|--------------------|--------------------|-----------------------|-----------------------|-------------------------|----------------|------|
| Top | Base | Thickness | Litho Code | Lithologic English | Lithologic Italian | Lithologic original 1 | Lithologic original 2 | Original Formation Name | Formation Name | Code |
| 0.00 | 12.00 | 12.00 | 4400 | gravel | ghiaia | Ghiaia | | | | |
| [m] a.g.l. [m] a.g. [m] | | | | | | | | | | |
| 8.49 | -3.51 | | | | | | | | | |
| [m] a.s.l. [m] a.s.l. | | | | | | | | | | |
| 12.00 | 15.00 | 3.00 | 3140 | sand with gravel | sabbia con ghiaia | Sabbia con ghiaia | | | | |
| [m] a.g.l. [m] a.g. [m] | | | | | | | | | | |
| -3.51 | -6.51 | | | | | | | | | |
| [m] a.s.l. [m] a.s.l. | | | | | | | | | | |
| 15.00 | 38.00 | 23.00 | 4130 | gravel with sand | ghiaia con sabbia | Ghiaia con sabbia | | | | |
| [m] a.g.l. [m] a.g. [m] | | | | | | | | | | |
| -6.51 | -29.51 | | | | | | | | | |
| [m] a.s.l. [m] a.s.l. | | | | | | | | | | |
| 38.00 | 54.00 | 16.00 | 4400 | gravel | ghiaia | Ghiaia cementato/a | | | | |
| [m] a.g.l. [m] a.g. [m] | | | | | | | | | | |
| -29.51 | -45.51 | | | | | | | | | |
| [m] a.s.l. [m] a.s.l. | | | | | | | | | | |
| 54.00 | 60.00 | 6.00 | 4210 | clayey gravel | ghiaia argillosa | Ghiaia argilloso/a | | | | |
| [m] a.g.l. [m] a.g. [m] | | | | | | | | | | |
| -45.51 | -51.51 | | | | | | | | | |
| [m] a.s.l. [m] a.s.l. | | | | | | | | | | |
| 60.00 | 70.10 | 10.10 | 4400 | gravel | ghiaia | Ghiaia cementato/a | | | | |
| [m] a.g.l. [m] a.g. [m] | | | | | | | | | | |
| -51.51 | -61.61 | | | | | | | | | |
| [m] a.s.l. [m] a.s.l. | | | | | | | | | | |
| * | | | | | | | | | | |
| [m] a.g.l. [m] a.g. [m] | | | | | | | | | | |
| | | | | | | | | | | |
| [m] a.s.l. [m] a.s.l. | | | | | | | | | | |

Record: 1 di 6

Record: 1 di 1 (Filtrati)

CONVERSION TOOLS

FILTERS

REMOVE ALL FILTERS

SOURCE

SUBSOURCE

GOV GIS

PHYSIOGRAPHIC

AQUIFER TYPE

QUERIES

ADD SCREENS LITHOLOGY

CALCULATE HYDRO CHEMICAL PARAMETERS

ALL OTHERS QUERIES

CALCULATE sea level

CREATE NEW QUERY

UPDATE PATH

II Geodatabase idrogeologico

WELLS
WELL ID **42493** PROJECT **ASTIS-GEP** MATCHING VERIFIED

LOCATION AND MAIN DATA OWNER AND USES DRILLING GEOLITHOLOGY SCREENS AND LITHOLOGY BIBLIOGRAPHY IMAGES AQUIFERS SURVEY

ID AQUIFER **507** Rock/Alluvial Alluvial Aquifer Type Phreatic Aquifer Name Unknown Artesian Natural Discharge [L/s] Assignment

HYDROGEOLOGIC PUMPING TEST HYDROCHEMICAL

AQUIFER CHARACTERISTICS

GEOMETRICAL CHARACTERISTICS

Top Depth [m] Top a.s.l. [m] Thickness [m]
 Base Depth [m] Base a.s.l. [m]

HYDROGEOLOGICAL PARAMETERS

Transmissivity [m2/s] Storativity Specific Yield
 Hydraulic Cond. [m/s] Specific Storage
 Note

REMARKS AND DATA QUALITY

Remarks
 Correction
 Data Quality

AQUIFER MONITORING

| Survey by | Date [gg-mm-aa-hh-mm-ss] | Acquisition | Instruments | Static Water Level [m] b.g.l. | Temp [m] a.s.l. [°C] | E.C. [µS/cm] | Remarks | Correction |
|--------------|-----------------------------|-------------|-------------|----------------------------------|-------------------------|-----------------|---------|------------|
| RETE REG FVG | 07/01/1985 12.00.00 | | | 3.44 | 5.05 | | | |
| RETE REG FVG | 21/01/1985 12.00.00 | | | 3.62 | 4.87 | | | |
| RETE REG FVG | 25/01/1985 12.00.00 | | | 2.52 | 5.97 | | | |
| RETE REG FVG | 26/01/1985 12.00.00 | | | 2.57 | 5.92 | | | |
| RETE REG FVG | 27/01/1985 12.00.00 | | | 2.32 | 6.17 | | | |
| RETE REG FVG | 02/02/1985 12.00.00 | | | 2.67 | 5.82 | | | |
| RETE REG FVG | 05/02/1985 12.00.00 | | | 2.87 | 5.62 | | | |
| RETE REG FVG | 08/02/1985 12.00.00 | | | 3.02 | 5.47 | | | |
| RETE REG FVG | 11/02/1985 12.00.00 | | | 2.96 | 5.53 | | | |
| RETE REG FVG | 14/02/1985 12.00.00 | | | 3.02 | 5.47 | | | |
| RETE REG FVG | 17/02/1985 12.00.00 | | | 3.12 | 5.37 | | | |
| RETE REG FVG | 20/02/1985 12.00.00 | | | 3.22 | 5.27 | | | |
| RETE REG FVG | 23/02/1985 12.00.00 | | | 3.33 | 5.16 | | | |
| RETE REG FVG | 26/02/1985 12.00.00 | | | 3.44 | 5.05 | | | |
| RETE REG FVG | 02/03/1985 12.00.00 | | | 3.52 | 4.97 | | | |
| RETE REG FVG | 05/03/1985 12.00.00 | | | 3.29 | 5.20 | | | |

AQUIFER MONITORING STATISTICS

Min Date Max Date n of measure Min SWL Max SWL Min SWL sl Max SWL sl

Record: di 1

Record: di 1 (Filtrati)

CONVERSION TOOLS

POMA

FILTERS

REMOVE ALL FILTERS

SOURCE

SUBSOURCE

GOV GIS

PHYSIOGRAPHIC

AQUIFER TYPE

QUERIES

ADD SCREENS LITHOLOGY

CALCULATE HYDRO CHEMICAL PARAMETERS

ALL OTHERS QUERIES

CALCULATE sea level

CREATE NEW QUERY

UPDATE PATH

Il Geodatabase idrogeologico

WELLS

WELL ID **42509** PROJECT **ASTIS-GEP** MATCHING VERIFIED

LOCATION AND MAIN DATA OWNER AND USES DRILLING GEOLITHOLOGY SCREENS AND LITHOLOGY BIBLIOGRAPHY IMAGES AQUIFERS SURVEY

ID AQUIFER 43629 Rock/Alluvial Unknown Aquifer Type Unknown Aquifer Name Unknown Artesian Natural Discharge [L/s] Assignment

HYDROGEOLOGIC PUMPING TEST HYDROCHEMICAL

Sampling Date 03/07/2013 Source ARPA Code Weather Survey by Sampling Depth [m]
 Sampling Year 2013 Sub Source Project ASTIS-GEP Hydro Conditions Sampling Artesian Sampling Note

MAIN PARAMETERS CONTAMINANTS SCHOELLER AND PIE DIAGRAM

IN SITU SURVEY

T Air [°C] pH 7.50 EC [µS/cm] 423.0 CO2 [mg/L]
 T Water [°C] 13.80 Eh [mV] O2 [mg/L] 8.8
 Instruments Note

LABORATORY DATA

Lab Name ARPA Sample Code
 Analysis Date Analytical Method
 Lab Note

SATURATION INDEXES

Calcite
Dolomite
Aragonite
Gypsum
Anhydrite
Halite
Quartz
Chalcedony
Talc
Fluorite

IONS RATIO

Ca/Mg
Ca/SO4
Mg/SO4
Na/Cl
(Na+K)/Cl

IONS BALANCE

Σ cations
Σ anions
Balance [%]

PIPER CATIONS % PIPER ANIONS %

Ca [%] HCO3+CO3 [%]
Mg [%] SO4 [%]
Na+K [%] Cl [%]

PIPER WATER TYPE AND FACIES

KURLOV WATER TYPE

WATER QUALITY (CIVITA CLASSIFICATION)

Human Consumption Quality GR1
Human Consumption GR2
Agricultural Quality

MICROBIOLOGY

Lab Name Sample Code
 Analysis Date Analytical Method
 Instruments Note

Total Coliforms * Clostridium Perfringens *
 Fecal Coliforms * Pathogens Enterobacteria
 Fecal Streptococci * Salmonella
 Colony sum 20 °C ** Pseudomonas Aeruginosa *
 Colony sum 22 °C ** Aeromonas Hydrophyla
 Colony sum 36°C Agar ** Pathogens Staphylococci
 Colony sum 37 °C ** Fungi
 Clostridi spores ** * [UFC/100mL] ** [UFC/mL]

ISOTOPES

Lab Name UNIPD
 Sample Code Analysis Date
 Analytical Method
 Instruments
 Note

δ18O AND δ2H OTHERS

δ18O [‰] V-SMOW -7.25 δ15N
 δ2H [‰] SMOW -47.31 δ43S
 d 3H [UT]
 87Sr/86Sr

RADIOCARBON

δ13C Uncorrected Age 14C
 δ13C-DIC [‰] Corrected Age 14C
 14C-DIC [%-modern] Correction Method

PHYSICAL PARAMETERS

T [°C] pH 7.5 Eh [mV]
 Turbidity [NTU] 0.3 RF 180 °C
 TDS [mg/L] EC [µS/cm] 423.0
 Calc TDS [mg/L]
 TDS Difference as %
 Ratio EC /TDS EC/CalcTDS
 Mineral. Class
 TH [mg/L] TH [°f]
 Hardness Class:
 Alkalinity [mg/L] Alkalinity [°f]
 Organoleptic_Character

MAJOR IONS CONC.

[mg/L] [meq/L] [meq%]

Ca 51.9
Mg 9.6
Na 5.0
K 0.6
NH4 0.050
HCO3 196.5
CO3
SO4 7.7
Cl 4.2
NO3 7.4

SECONDARY ELEMENTS

SiO2 [mg/L] FeII [µg/L] 2.000 d.l.
 O2 [mg/L] 8.8 Mn [µg/L] 3.000 d.l.
 CO2 [mg/L] T.O.C. [mg/L]
 NO2 [mg/L] 0.0100 B.O.D. [mg/L]
 H2S [mg/L] 0.0 C.O.D. [mg/L]

CHEMICAL INDEXES

SAR
RSC [meq/L]
Na % SSP

Remarks Bicarbonate calculated Data Quality

Record: 1 di 2

Record: 1 di 1

Record: 1 di 1 (Filtrati)

CONVERSION TOOLS

FILTERS

REMOVE ALL FILTERS

SOURCE

SUBSOURCE

GOV GIS

PHYSIOGRAPHIC

AQUIFER TYPE

QUERIES

ADD SCREENS LITHOLOGY

CALCULATE HYDRO CHEMICAL PARAMETERS

ALL OTHERS QUERIES

CALCULATE sea level

CREATE NEW QUERY

UPDATE PATH

Il Geodatabase idrogeologico

WELLS

WELL ID **42509** PROJECT **ASTIS-GEP** MATCHING VERIFIED

LOCATION AND MAIN DATA OWNER AND USES DRILLING GEOLITHOLOGY SCREENS AND LITHOLOGY BIBLIOGRAPHY IMAGES AQUIFERS SURVEY

ID AQUIFER 43629 Rock/Alluvial Unknown Aquifer Type Unknown Aquifer Name Unknown Artesian Natural Discharge [L/s] Assignment

HYDROGEOLOGIC PUMPING TEST HYDROCHEMICAL

Sampling Date 03/07/2013 Source ARPA Code Weather Survey by Sampling Depth [m]
 Sampling Year 2013 Sub Source Project ASTIS-GEP Hydro Conditions Sampling Artesian Sampling Note

MAIN PARAMETERS CONTAMINANTS SCHOELLER AND PIE DIAGRAM

IN SITU SURVEY

T Air [°C] pH 7.50 EC [µS/cm] 423.0 CO2 [mg/L]
 T Water [°C] 13.80 Eh [mV] O2 [mg/L] 8.8
 Instruments Note

LABORATORY DATA

Lab Name ARPA Sample Code
 Analysis Date Analytical Method
 Lab Note

PHYSICAL PARAMETERS

T [°C] pH 7.5 Eh [mV]
 Turbidity [NTU] 0.3 RF 180 °C
 TDS [mg/L] EC [µS/cm] 423.0
 Calc TDS [mg/L] 274.9
 TDS Difference as %
 Ratio EC/TDS EC/CalcTDS
 Mineral. Class
 TH [mg/L] 169.1 TH [°f] 16.91
 Hardness Class: POORLY HARD
 Alkalinity [mg/L] 161.1 Alkalinity [°f] 16.11
 Organoleptic_Character

MAJOR IONS CONC.

| | [mg/L] | [meq/L] | [meq%] |
|------|--------|---------|--------|
| Ca | 51.9 | 2.5899 | 35.81 |
| Mg | 9.6 | 0.7900 | 10.92 |
| Na | 5.0 | 0.2175 | 3.01 |
| K | 0.6 | 0.0153 | 0.21 |
| NH4 | 0.050 | 0.0028 | 0.04 |
| HCO3 | 196.5 | 3.2196 | 44.51 |
| CO3 | | | |
| SO4 | 7.7 | 0.1603 | 2.22 |
| Cl | 4.2 | 0.1185 | 1.64 |
| NO3 | 7.4 | 0.1193 | 1.65 |

SECONDARY ELEMENTS

| | | | |
|-------------|---------------|-------|------|
| SiO2 [mg/L] | Fell [µg/L] | 2.000 | d.l. |
| O2 [mg/L] | Mn [µg/L] | 3.000 | d.l. |
| CO2 [mg/L] | T.O.C. [mg/L] | | |
| NO2 [mg/L] | B.O.D. [mg/L] | | |
| H2S [mg/L] | C.O.D. [mg/L] | | |

CHEMICAL INDEXES

| | |
|-------------|--------|
| SAR | 0.167 |
| RSC [meq/L] | -0.160 |
| Na % SSP | 6.015 |

Remarks Bicarbonate calculated Data Quality High Quality (ions balar)

SATURATION INDEXES

Calcite Dolomite Aragonite Gypsum Anhydrite Halite Quartz Chalcedony Talc Fluorite

IONS RATIO

| | |
|-----------|-------|
| Ca/Mg | 3.28 |
| Ca/SO4 | 16.16 |
| Mg/SO4 | 4.93 |
| Na/Cl | 1.84 |
| (Na+K)/Cl | 1.97 |

IONS BALANCE

| | |
|-------------|-------|
| Σ cations | 3.62 |
| Σ anions | 3.62 |
| Balance [%] | -0.03 |

PIPER CATIONS % PIPER ANIONS %

| | | | |
|----------|-------|--------------|-------|
| Ca [%] | 71.63 | HCO3+CO3 [%] | 89.00 |
| Mg [%] | 21.85 | SO4 [%] | 4.43 |
| Na+K [%] | 6.44 | Cl [%] | 3.27 |

PIPER WATER TYPE AND FACIES

BICARBONATE-CALCIC

KURLOV WATER TYPE

Calcium Bicarbonate

WATER QUALITY (CIVITA CLASSIFICATION)

| | |
|-------------------------------|------------|
| Human Consumption Quality GR1 | A1 |
| Human Consumption GR2 | B2 |
| Agricultural Quality | 1a Quality |

MICROBIOLOGY

Lab Name Sample Code
 Analysis Date Analytical Method
 Instruments Note

| | |
|-------------------------|---------------------------|
| Total Coliforms * | Clostridium Perfringens * |
| Fecal Coliforms * | Pathogens Enterobacteria |
| Fecal Streptococci * | Salmonella |
| Colony sum 20 °C ** | Pseudomonas Aeruginosa * |
| Colony sum 22 °C ** | Aeromonas Hydrophyla |
| Colony sum 36°C Agar ** | Pathogens Staphylococci |
| Colony sum 37 °C ** | Fungi |
| Clostridi spores ** | * [UFC/100mL] ** [UFC/mL] |

ISOTOPES

Lab Name UNIPD
 Sample Code Analysis Date
 Analytical Method
 Instruments
 Note

| δ18O AND δ2H | | OTHERS | |
|-----------------|--------|-----------|--|
| δ18O [‰] V-SMOW | -7.25 | δ15N | |
| δ2H [‰] SMOW | -47.31 | δ43S | |
| d | | 3H [UT] | |
| | | 87Sr/86Sr | |

RADIOCARBON

| | |
|--------------------|---------------------|
| δ13C | Uncorrected Age 14C |
| δ13C-DIC [‰] | Corrected Age 14C |
| 14C-DIC [%-modern] | Correction Method |

CONVERSION TOOLS

FILTERS

REMOVE ALL FILTERS

SOURCE

SUBSOURCE

GOV GIS

PHYSIOGRAPHIC

AQUIFER TYPE

QUERIES

ADD SCREENS LITHOLOGY

CALCULATE HYDRO CHEMICAL PARAMETERS

ALL OTHERS QUERIES

CALCULATE sea level

CREATE NEW QUERY

UPDATE PATH

Il Geodatabase idrogeologico

WELLS
WELL ID **42509** PROJECT **ASTIS-GEP** MATCHING VERIFIED

LOCATION AND MAIN DATA OWNER AND USES DRILLING GEOLITHOLOGY SCREENS AND LITHOLOGY BIBLIOGRAPHY IMAGES AQUIFERS SURVEY

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Sampling Date 03/07/2013 Source ARPA Code Weather Survey by Sampling Depth [m]
Sampling Year 2013 Sub Source Project ASTIS-GEP Hydro Conditions Sampling Artesian Sampling Note

MAIN PARAMETERS CONTAMINANTS SCHOELLER AND PIE DIAGRAM

SCHOELLER DIAGRAM (mod.) [meq/l]

| Ion | Concentration [meq/l] |
|------|-----------------------|
| Ca | ~2.5 |
| Mg | ~0.8 |
| Na | ~0.2 |
| Cl | ~0.12 |
| SO4 | ~0.15 |
| HCO3 | ~3.5 |
| NO3 | ~1.5 |

PIE DIAGRAM [meq/l]

| Ion | Percentage |
|------|------------|
| Ca | 36% |
| Mg | 11% |
| Na | 3% |
| Cl | 2% |
| SO4 | 2% |
| NO3 | 2% |
| HCO3 | 44% |
| NH4 | 0% |
| K | 0% |

Record: 1 di 2

Record: 1 di 1

Record: 1 di 1 (Filtrati)

CONVERSION TOOLS

FILTERS
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AQUIFER TYPE

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Sampling Date 03/07/2013 Source ARPA Code Weather Survey by Sampling Depth [m]
 Sampling Year 2013 Sub Source Project ASTIS-GEP Hydro Conditions Sampling Artesian Sampling Note

MAIN PARAMETERS CONTAMINANTS SCHOELLER AND PIE DIAGRAM

| LABORATORY DATA | | | |
|-----------------|-----------------|--|--|
| Analysis Date | Sample Lab Code | | |
| Laboratory Name | ARPA | | |
| Instruments | | | |

| OTHERS MINOR COMPONENTS | | | |
|-------------------------|------|-------------|-------------|
| B [µg/L] | I.d. | F [µg/L] | 100.00 I.d. |
| Ba [µg/L] | I.d. | PO4 [µg/L] | 12.00 I.d. |
| Br [µg/L] | I.d. | P2O5 [µg/L] | I.d. |
| CN [µg/L] | I.d. | Sr [µg/L] | 89.00 I.d. |

| METALS | | | |
|---------------|-----------|-----------|-----------|
| Ag [µg/L] | I.d. | Hg [µg/L] | I.d. |
| Al [µg/L] | I.d. | Ni [µg/L] | 2.00 I.d. |
| As [µg/L] | I.d. | Pb [µg/L] | 3.00 I.d. |
| Be [µg/L] | I.d. | Rb [µg/L] | I.d. |
| Cd [µg/L] | 0.10 I.d. | Sb [µg/L] | I.d. |
| Cr VI [µg/L] | I.d. | Se [µg/L] | I.d. |
| Cr tot [µg/L] | 2.00 I.d. | Tl [µg/L] | I.d. |
| Co [µg/L] | I.d. | V [µg/L] | I.d. |
| Cu [µg/L] | 6.00 I.d. | Zn [µg/L] | 2.00 I.d. |

| PESTICIDES | |
|---------------------|--------------------|
| Metolachlor [µg/L] | Chloridazon [µg/L] |
| Pendimetalin [µg/L] | Lenacil [µg/L] |
| Propazine [µg/L] | Metribuzin [µg/L] |
| Diuron [µg/L] | Linuron [µg/L] |

| PESTICIDES | |
|-----------------------------|------|
| Alachlor [µg/L] | |
| Aldrin [µg/L] | |
| Atrazine [µg/L] | |
| Simazine [µg/L] | 0.02 |
| Terbutylazine [µg/L] | |
| Cyanazine [µg/L] | |
| Desethylatrazine [µg/L] | |
| Desisopropylatrazine [µg/L] | |
| Desetilterbutylazine [µg/L] | |
| Alfa-esachlorhexane [µg/L] | |
| Beta-esachlorhexane [µg/L] | |
| Gamma-esachlorhexane [µg/L] | |
| Chlordane [µg/L] | |
| DDD,DDT,DDE [µg/L] | |
| Dieldrin [µg/L] | |
| Endrin [µg/L] | |
| Pesticides Sumi [µg/L] | |
| PCDD and PCDF Sum [µg/L] | |
| PCB [µg/L] | |
| Acrylamide [µg/L] | |
| n-hexane [µg/L] | |
| Paraphthalic Acid [µg/L] | |
| Asbestos [µg/L] | |
| Bromacile [µg/L] | |
| Terbutrine [µg/L] | |

| ORGANIC COMPOUNDS | | | |
|----------------------------------|------|-----------------------------------|--|
| Benzene [µg/L] | | Hexachlorobutadiene [µg/L] | |
| Ethylbenzene [µg/L] | | 1,1 Dichloroethane [µg/L] | |
| Styrene [µg/L] | | 1,2Dichloroethylene [µg/L] | |
| Toluene [µg/L] | | Tribromomethane [µg/L] | |
| Para-xylene [µg/L] | | 1,2 Dibromoethane [µg/L] | |
| Benzo (a) anthracene [µg/L] | | Dibromochloromethane [µg/L] | |
| Benzo(a)pyrene [µg/L] | | Bromodichloromethane [µg/L] | |
| Benzo(b)fluoranthene [µg/L] | | Nitrobenzene [µg/L] | |
| Benzo(k)fluoranthene [µg/L] | | 1,2 Dinitrobenzene [µg/L] | |
| Benzo(g,h,i)perylene [µg/L] | | 1,3 Dinitrobenzene [µg/L] | |
| Chrysene [µg/L] | | Chloronitrobenze [µg/L] | |
| Dibenzo(a,h)anthracene [µg/L] | | MonoChlorobenzene [µg/L] | |
| Indenopyrene [µg/L] | | 1,2 Dichlorobenzene [µg/L] | |
| Pyrene [µg/L] | | 1,3 Dichlorobenzene [µg/L] | |
| Chloromethane [µg/L] | | 1,2,4 Trichlorobenzene [µg/L] | |
| Trichloromethane [µg/L] | 0.10 | 1,2,4,5 Tetrachlorobenzene [µg/L] | |
| Vinyl Chloride [µg/L] | | Pentachlorobenzene [µg/L] | |
| 1,2 Dichloroethane [µg/L] | | Esachlorobenzene [µg/L] | |
| 1,1 Dichloroethylene [µg/L] | | 2 Chlorophenol [µg/L] | |
| 1,2 Chloropropane [µg/L] | | 2,4 Dichlorophenol [µg/L] | |
| 1,1,1 Trichloroethane [µg/L] | | 2,4,6 TriChlorophenol [µg/L] | |
| Trichloroethylene [µg/L] | 0.10 | PentaChlorophenol [µg/L] | |
| 1,2,3 Trichloropropane [µg/L] | | Aniline [µg/L] | |
| 1,1,2,2 Tetrachloroethane [µg/L] | | Diphenylamine [µg/L] | |
| Tetrachloroethylene (PCE) [µg/L] | 0.10 | p-Toluidine [µg/L] | |
| Chloroform [µg/L] | | Methylenechloride [µg/L] | |

Record: 1 di 2

Record: 1 di 1

Record: 1 di 1 (Filtrati)

CONVERSION TOOLS

FILTERS

REMOVE ALL FILTERS

SOURCE

SUBSOURCE

GOV GIS

PHYSIOGRAPHIC

AQUIFER TYPE

QUERIES

ADD SCREENS LITHOLOGY

CALCULATE HYDRO CHEMICAL PARAMETERS

ALL OTHERS QUERIES

CALCULATE sea level

CREATE NEW QUERY

UPDATE PATH

Il Geodatabase idrogeologico

WELLS

WELL ID **52159** PROJECT MATCHING VERIFIED Yes

LOCATION AND MAIN DATA | OWNER AND USES | DRILLING | GEOLITHOLOGY | SCREENS AND LITHOLOGY | BIBLIOGRAPHY | IMAGES | AQUIFERS SURVEY

Author Pietro Benedetti dott. geol. **Pages** 22

Title Relazione geologica per la realizzazione di un pozzo per uso potabile presso l'acquedotto Farra d'Isonzo

Editor **ISBN** **Year** 2007

Cataloging

Biblio Code **Note**

Doc Name RELAZIONE GEOLOGICA GIUGNO 2007 IRIS ACQUA FARRA ISONZO.pdf

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* **Author** **Pages**

Title

Editor **ISBN** **Year**

Cataloging

Biblio Code **Note**

Doc Name

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CONVERSION TOOLS
POMA

FILTERS
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SOURCE

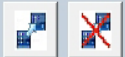
SUBSOURCE

GOV GIS

PHYSIOGRAPHIC

AQUIFER TYPE

QUERIES
ADD SCREENS LITHOLOGY
CALCULATE HYDRO CHEMICAL PARAMETERS
ALL OTHERS QUERIES
CALCULATE sea level
CREATE NEW QUERY
UPDATE PATH



Il Geodatabase idrogeologico

WELLS

WELL ID 52159 PROJECT MATCHING VERIFIED Yes

LOCATION AND MAIN DATA OWNER AND USES DRILLING GEOLITHOLOGY SCREENS AND LITHOLOGY BIBLIOGRAPHY IMAGES ACQUIFERS SURVEY

Author Pietro Benedetti dott. geol.
Title Relazione geologica per la realizzazione di un
Editor
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Biblio Code Note
Doc Name RELAZIONE GEOLOGICA GIUGNO 2007 IRIS ACC
Doc Path D:\INTERREG\INTERREG GIS\GIS\GDB\ANNEX

* Author
Title
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Doc Name
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Regione Autonoma Friuli Venezia Giulia
Provincia Gorizia
Comune Farra d'Isonzo

commitente:
IRISACQUA
Via IX agosto, 15
34170 GORIZIA

RELAZIONE GEOLOGICA
per la realizzazione di un pozzo per uso potabile presso
l'acquedotto di Farra d'isonzo

Dott. Geol. Pietro Benedetti
via Roma 42, 33056 Palazzolo dello Stella (Ud)
tel. 335 6435066 - email benedetti.p@iadiacom.it

20 GIU. 2007

CONVERSION TOOLS
POMA

FILTERS
REMOVE ALL FILTERS
SOURCE
SUBSOURCE
GOV GIS
PHYSIOGRAPHIC
AQUIFER TYPE

QUERIES
ADD SCREENS LITHOLOGY
CALCULATE HYDRO CHEMICAL PARAMETERS
ALL OTHERS QUERIES
CALCULATE sea level
CREATE NEW QUERY
UPDATE PATH

Il Geodatabase idrogeologico

WELLS


WELL ID 46649 PROJECT ASTIS-GEP MATCHING VERIFIED

LOCATION AND MAIN DATA OWNER AND USES DRILLING GEOLITHOLOGY SCREENS AND LITHOLOGY BIBLIOGRAPHY IMAGES AQUIFERS SURVEY

Image Type Photo Author Enrico Zavagno Note

Image Name 46649_0079_peci.jpg

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Record: 1 di 1 (Filtrati)

CONVERSION TOOLS

POMA

FILTERS

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SOURCE

SUBSOURCE

GOV GIS

PHYSIOGRAPHIC

AQUIFER TYPE

QUERIES

ADD SCREENS LITHOLOGY

CALCULATE HYDRO CHEMICAL PARAMETERS

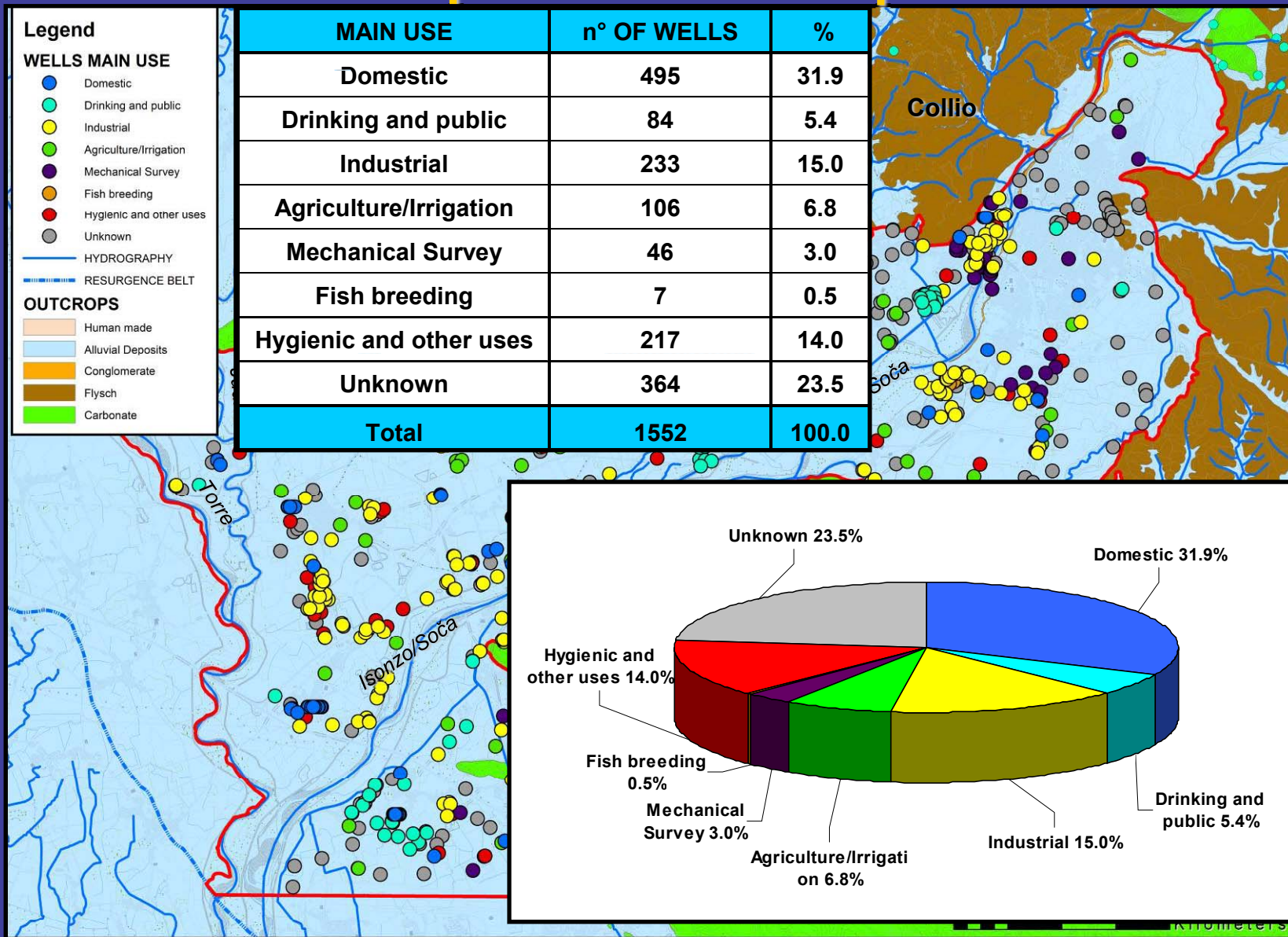
ALL OTHERS QUERIES

CALCULATE sea level

CREATE NEW QUERY

UPDATE PATH

Principali utilizzi dei pozzi



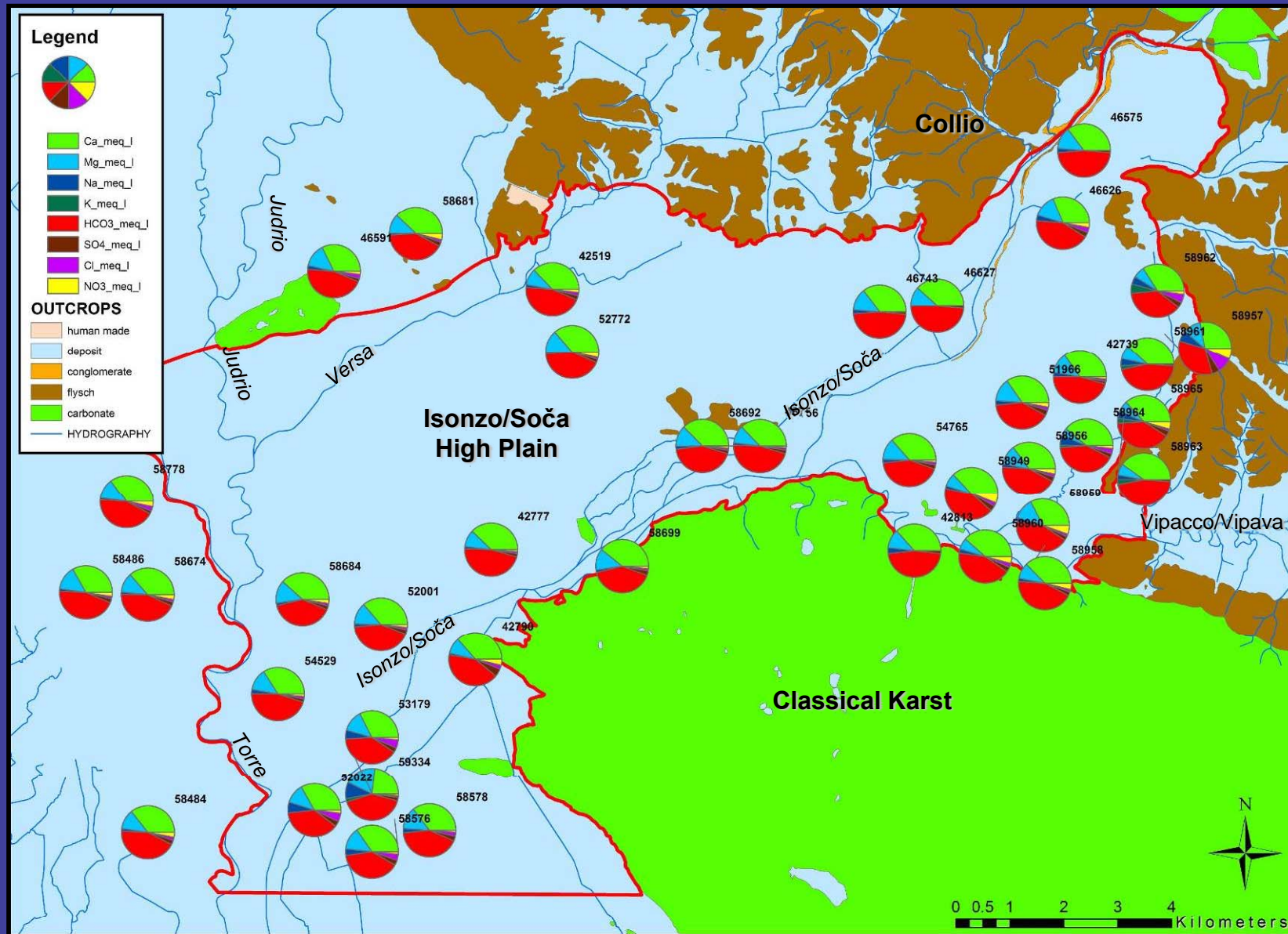
VAROVANJE VIROV PITNE VODE V IZREDNIH DOGODKIH / VODE SOŠKEGA ALUVIJA

Evento informativo-divulgativo/Strokovno izobraževanje

Bando Pubblico per la presentazione di progetti standard n. 02/2009 / Javni razpis za predložitev standardnih projektov št. 02-2009: GEP



Analisi idrochimiche



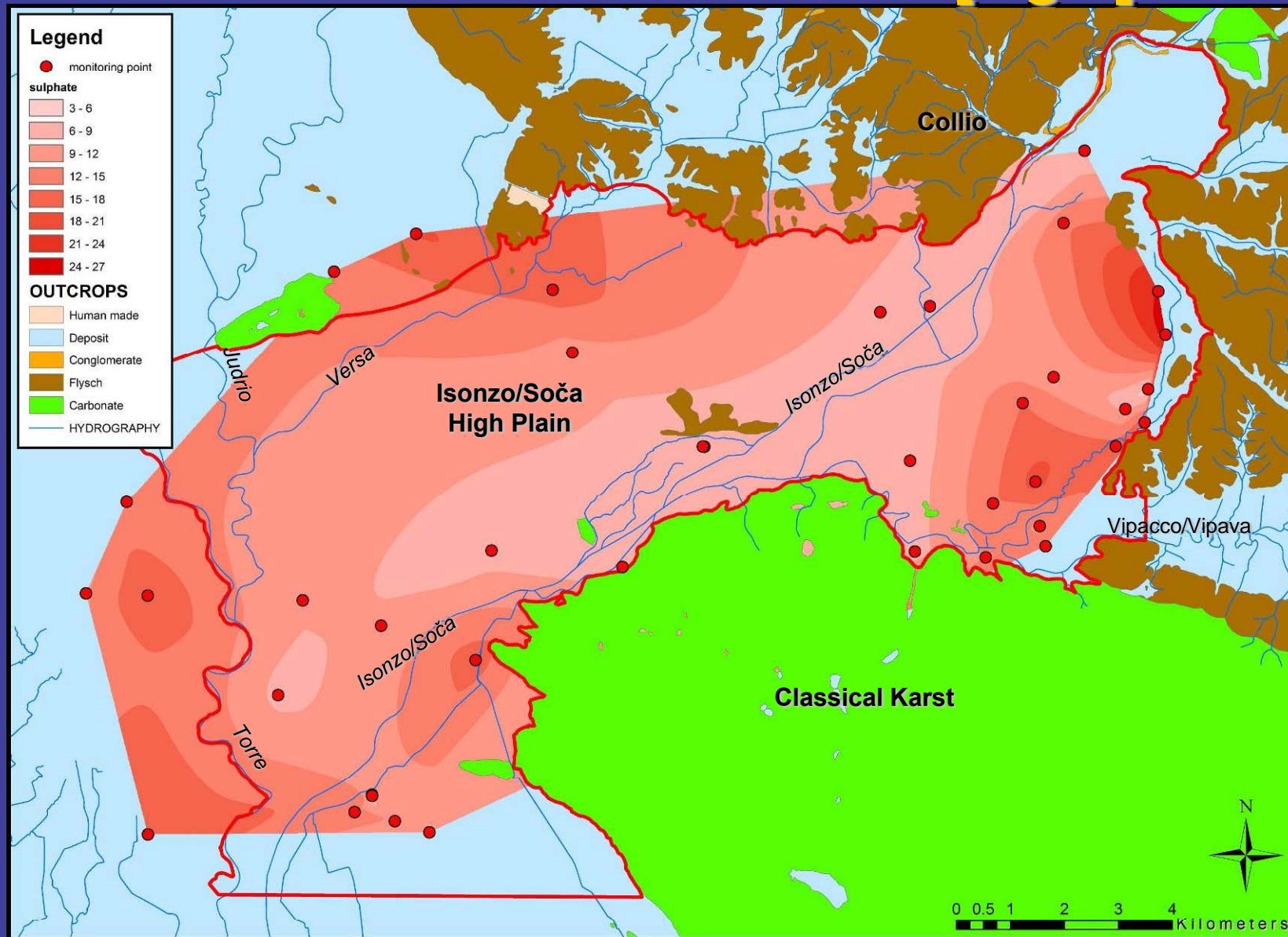
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Evento informativo-divulgativo/Strokovno izobraževanje

Bando Pubblico per la presentazione di progetti standard n. 02/2009 / Javni razpis za predložitev standardnih projektov št. 02-2009: GEP



Analisi idrochimiche: solfati [mg/L]



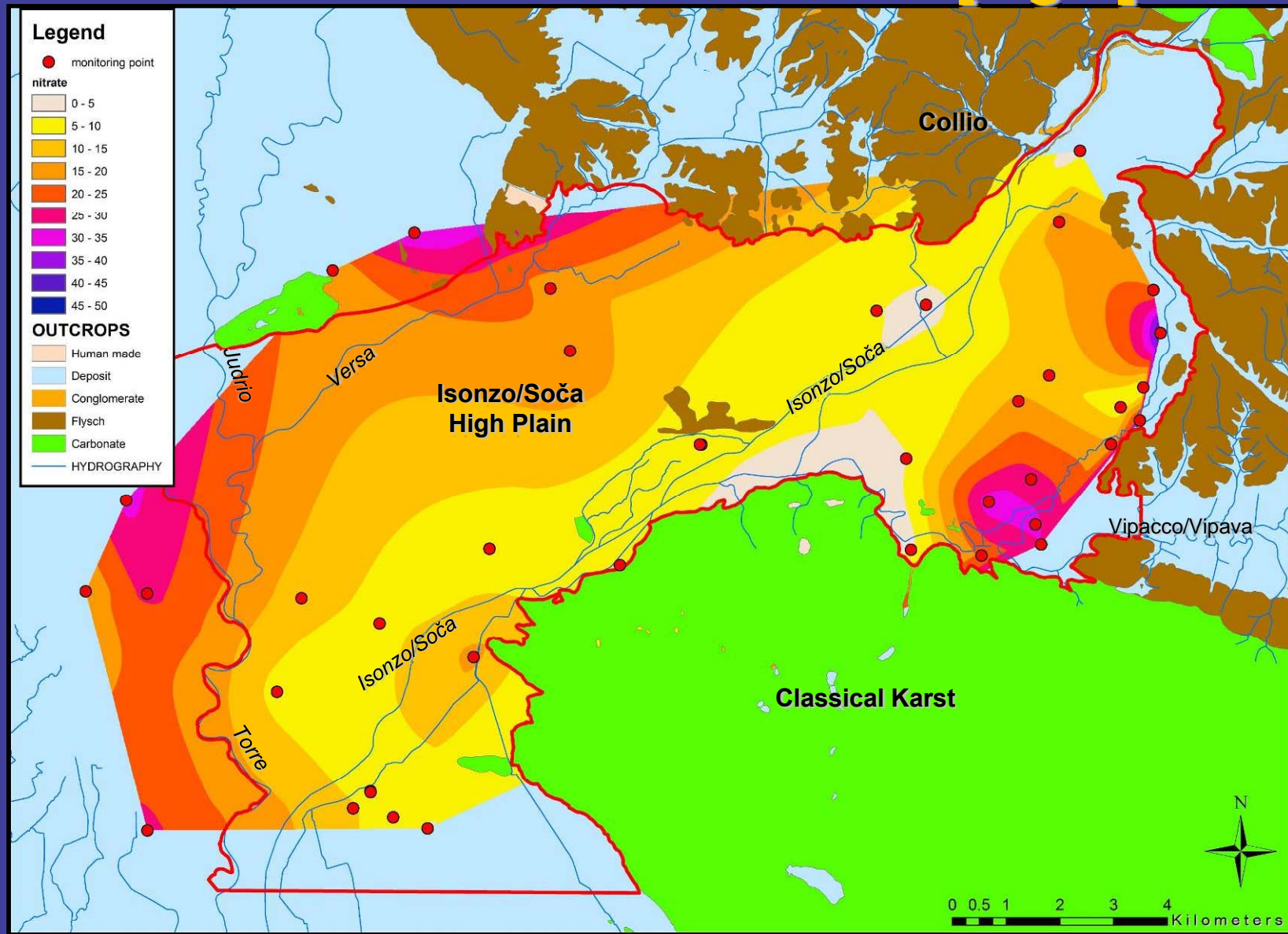
VAROVANJE VIROV PITNE VODE V IZREDNIH DOGODKIH / VODE SOŠKEGA ALUVIJA

Evento informativo-divulgativo/Strokovno izobraževanje

Bando Pubblico per la presentazione di progetti standard n. 02/2009 / Javni razpis za predložitev standardnih projektov št. 02-2009: GEP



Analisi idrochimiche: nitrati [mg/L]



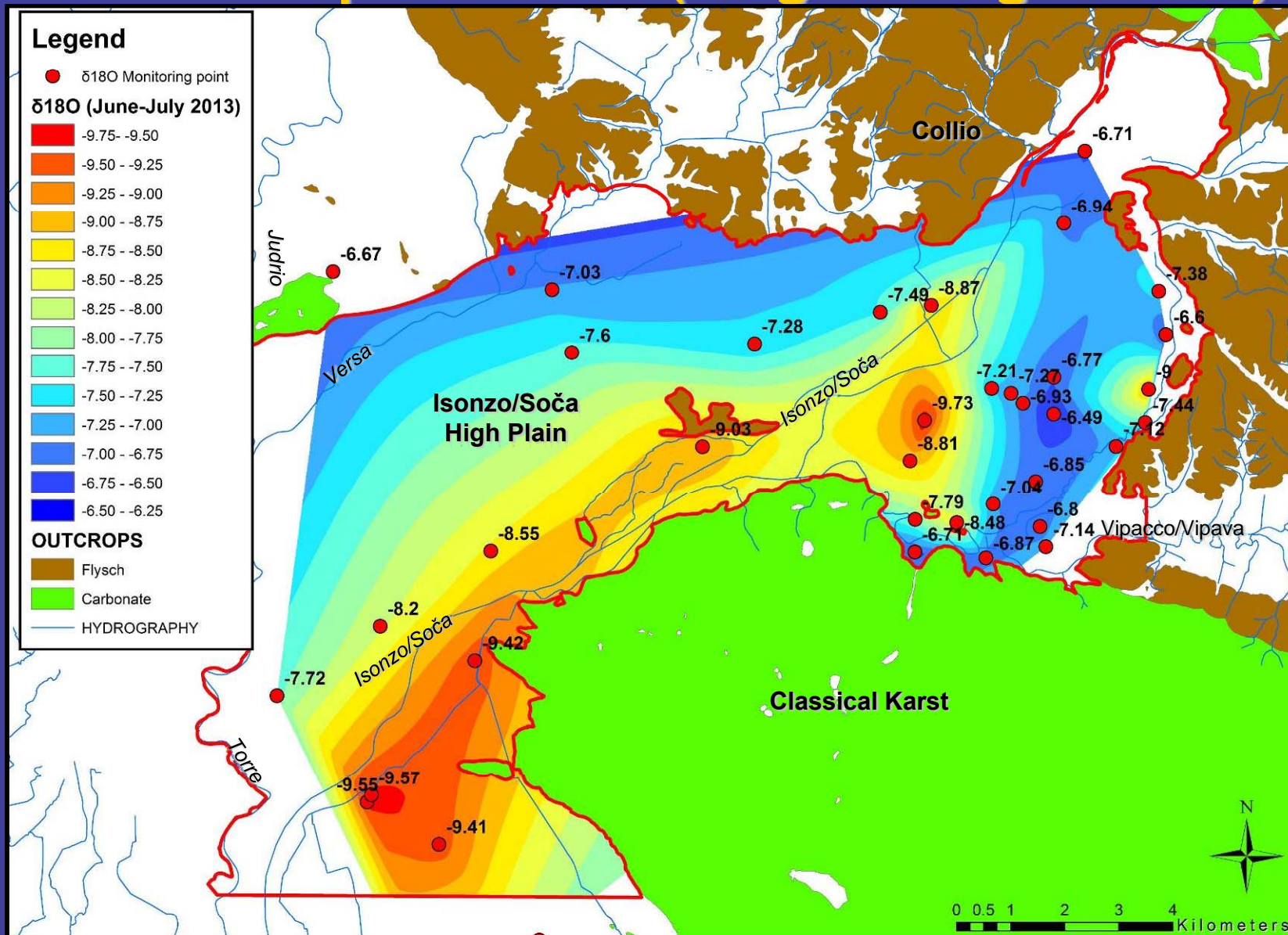
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Evento informativo-divulgativo/Strokovno izobraževanje

Bando Pubblico per la presentazione di progetti standard n. 02/2009 / Javni razpis za predložitev standardnih projektov št. 02-2009: GEP



Analisi isotopiche: $\delta^{18}\text{O}$ (Giugno - Luglio 2013)



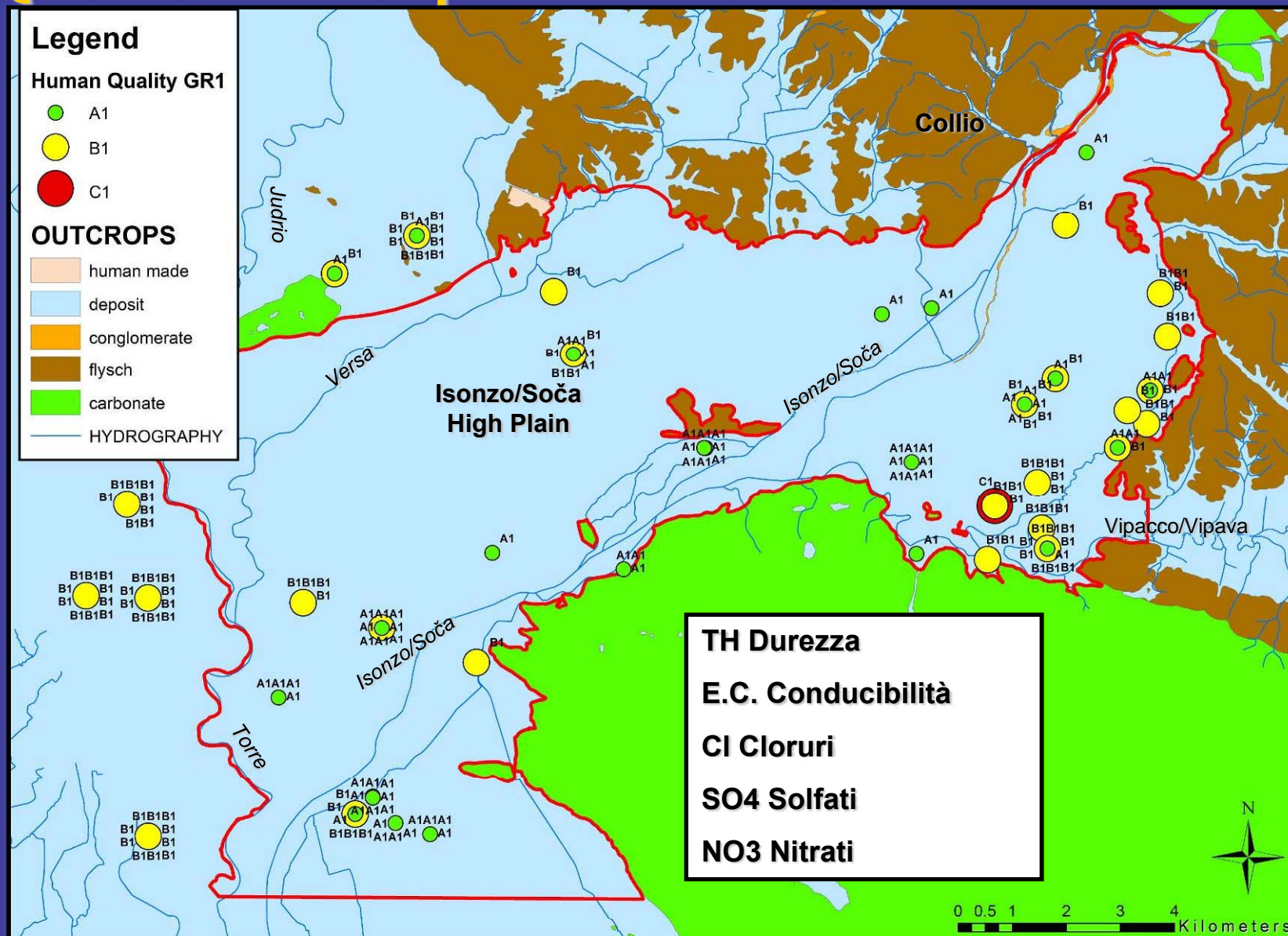
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Qualità delle acque destinate al consumo umano



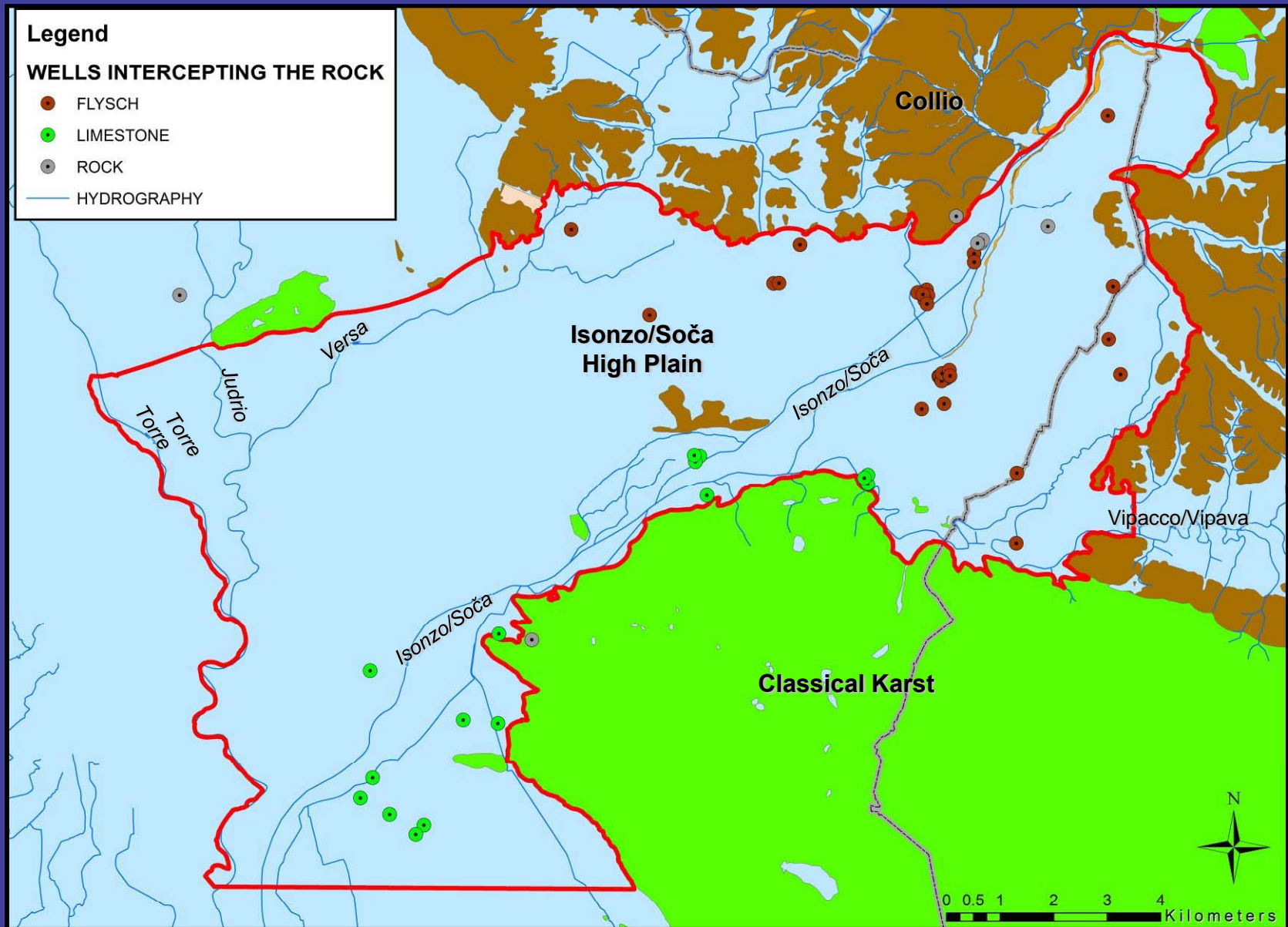
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Ricostruzione dell'andamento del substrato roccioso: dati pozzi



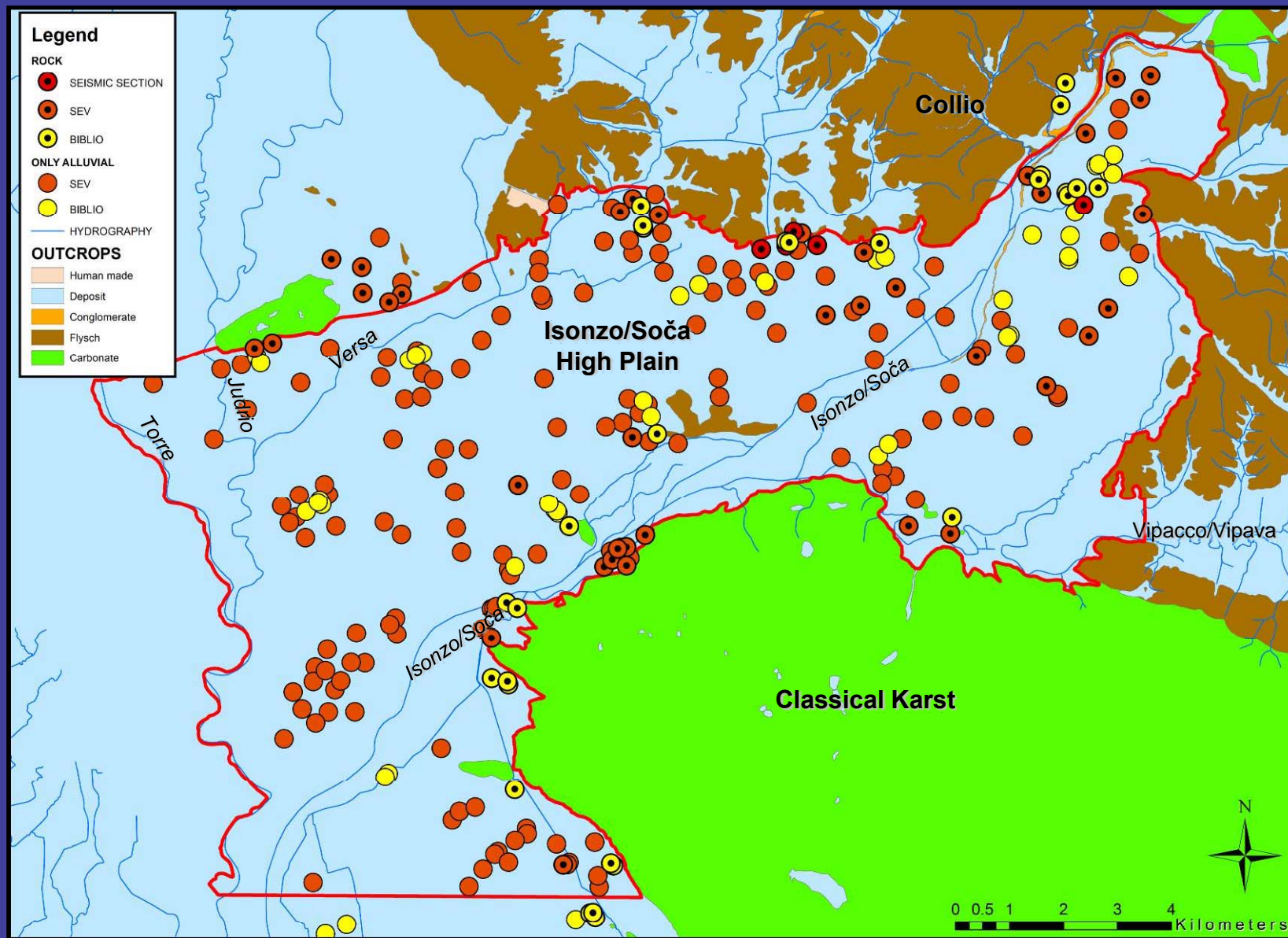
VAROVANJE VIROV PITNE VODE V IZREDNIH DOGODKIH / VODE SOŠKEGA ALUVIJA

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Bando Pubblico per la presentazione di progetti standard n. 02/2009 / Javni razpis za predložitev standardnih projektov št. 02-2009: GEP



Ricostruzione dell'andamento del substrato roccioso: dati geofisici



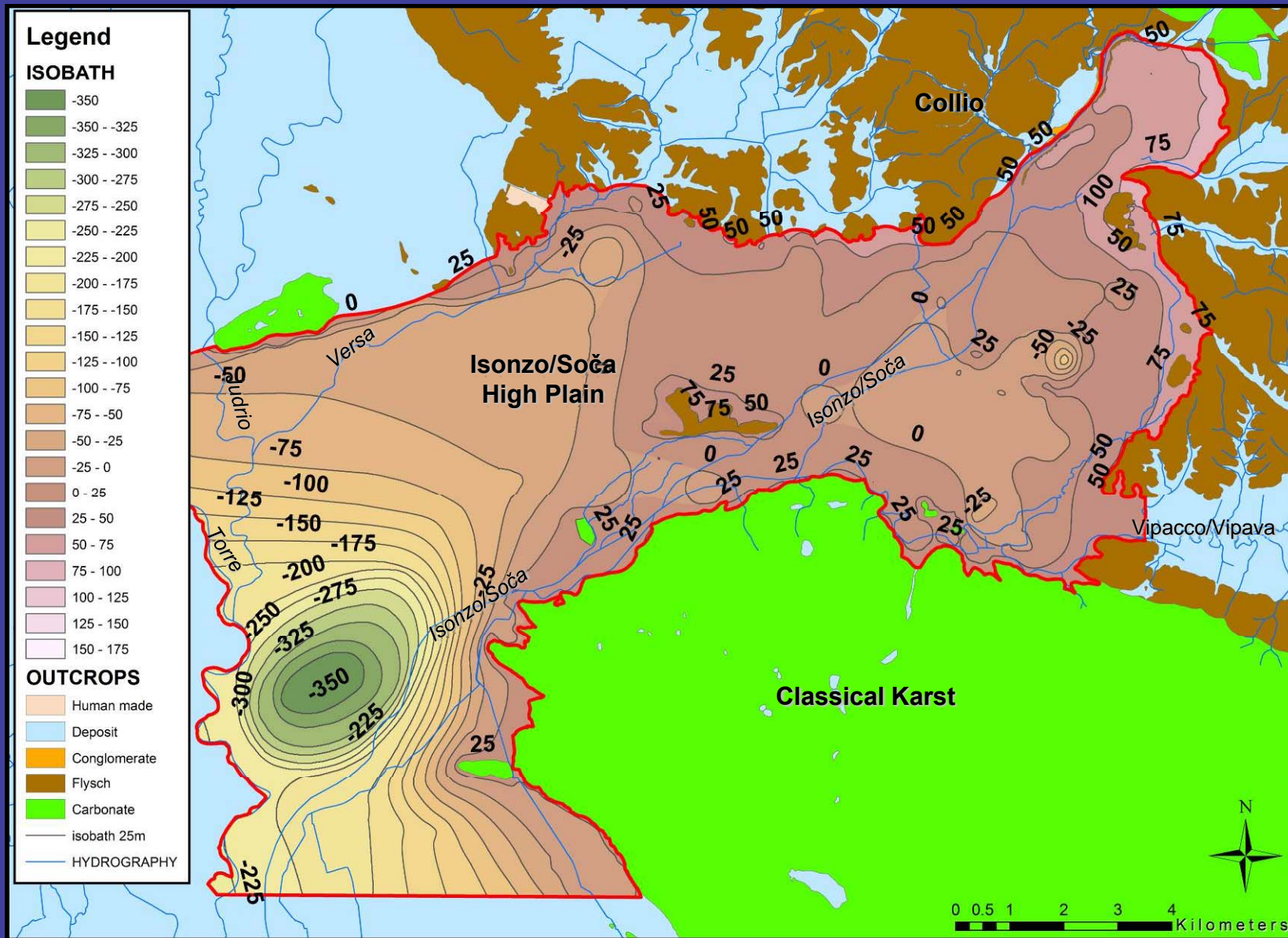
VAROVANJE VIROV PITNE VODE V IZREDNIH DOGODKIH / VODE SOŠKEGA ALUVIJA

Evento informativo-divulgativo/Strokovno izobraževanje

Bando Pubblico per la presentazione di progetti standard n. 02/2009 / Javni razpis za predložitev standardnih projektov št. 02-2009: GEP



Isobate del substrato roccioso



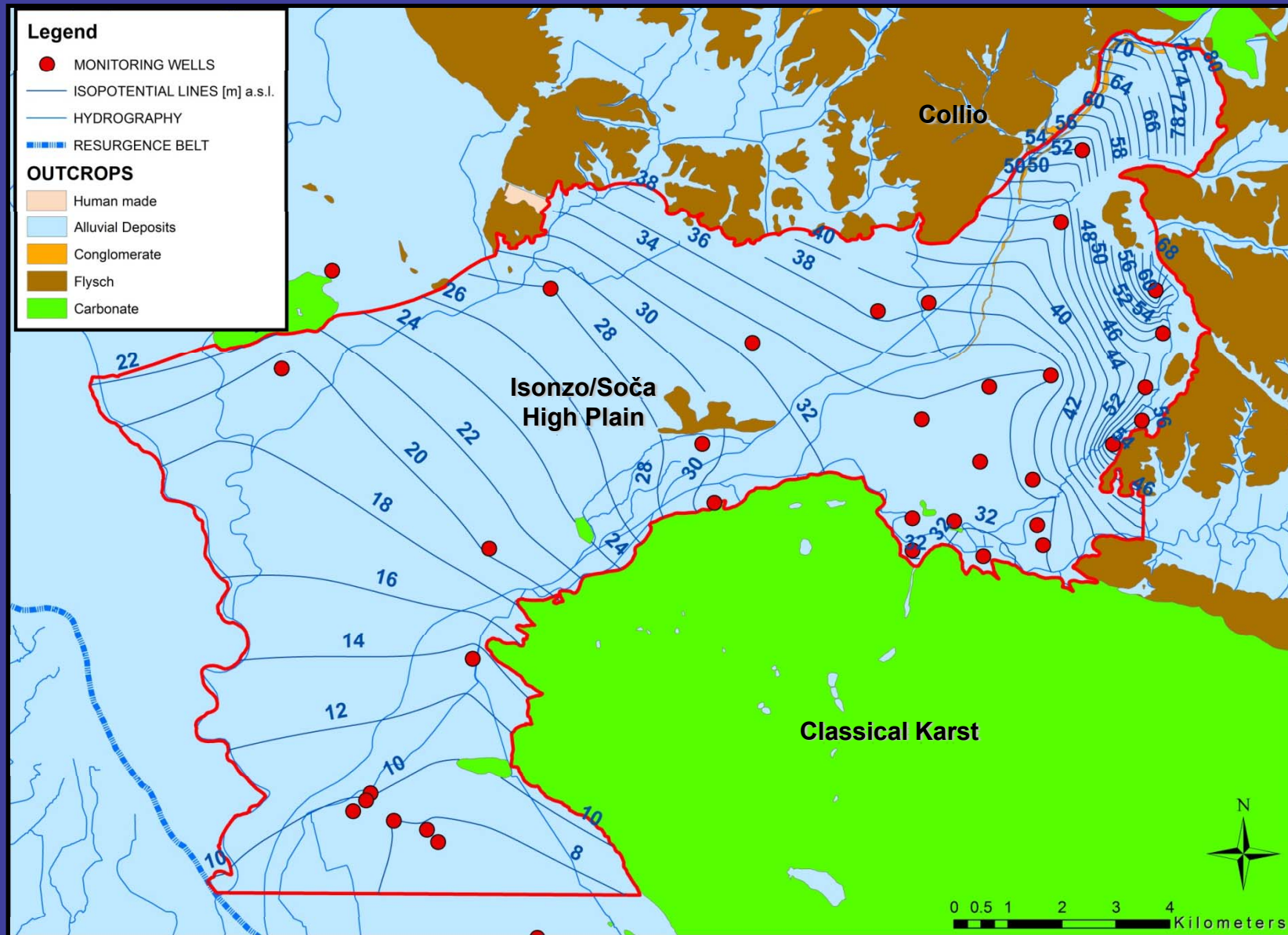
VAROVANJE VIROV PITNE VODE V IZREDNIH DOGODKIH / VODE SOŠKEGA ALUVIJA

Evento informativo-divulgativo/Strokovno izobraževanje

Bando Pubblico per la presentazione di progetti standard n. 02/2009 / Javni razpis za predložitev standardnih projektov št. 02-2009: GEP



Isofreatiche [m] l.m.m. (Giugno 2013)



VAROVANJE VIROV PITNE VODE V IZREDNIH DOGODKIH / VODE SOŠKEGA ALUVIJA

Evento informativo-divulgativo/Strokovno izobraževanje

Bando Pubblico per la presentazione di progetti standard n. 02/2009 / Javni razpis za predložitev standardnih projektov št. 02-2009: GEP



STROKOVNO IZOBRAŽEVANJE NA TEMO / *EVENTO INFORMATIVO -DIVULGATIVO*

**VAROVANJE VIROV PITNE VODE
V IZREDNIH DOGODKIH**

Osnove hidrologije, krasoslovja in prostorske analize

*TUTELA DELLE RISORSE DI ACQUA POTABILE IN SITUAZIONI DI EMERGENZA
Basi di idrogeologia, carsologia e analisi territoriale*

**IDROGEOLOGIA DELLA PIANURA ISONTINA/
HIDROGEOLOGIJA SOŠKE NIŽINE**

cucchi@univ.trieste.it

*Dipartimento di Matematica e Geoscienze,
Università di Trieste*



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