Walhalla Kalk Steinbruch
Important substitute habitat for endangered cavity-nesting birds

Final report QuarryLifeAward

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1. Introduction

Even though quarries are biotopes created by humans, one should not underestimate their potential for nature conservation. The heterogenic and dynamic habitats that rise in quarries during the quarrying, offer important substitute habitats, especially for threatened species. The quarry “Walhalla Kalk” in Regensburg is also inhabited by threatened cavity nesting birds such as the Northern Wheatear (*Oenanthe oenanthe*) and the Eurasian eagle owl (*Bubo bubo*). Object of this project is the sustainable support of those two endangered species during the mining operations in the quarry until 2050. Therefore, we want to develop breeding areas and a hunting area in those areas of the quarry that are already out of use.

2. Description of the project area

2.1 Position of the quarry Walhalla Kalk

The project area lies in the quarry of the Walhalla Kalk GmbH & Co. KG in Regensburg which has a total area of approx.. 135 ha. Production facilities are situated in the west of the quarry and several nature reserves as well as the village Keilberg neighbour on the east side of the area.

Something special about Regensburg are the four different natural regions that come together at this range: The Falkensteiner Vorwald in the east (Annex 1 No. 406), a thick coniferous forest. Southwestward the Donau-Isar-Hügelland (Annex 1 Nr. 062), the Frankenalb at the North (Annex 1 Nr. 081) and the fertile Gäuboden of the Dungaus in south-east (Annex 1 Nr. 064) which are more hilly and mainly in agricultural use. Because of the different features of each natural region, Regensburg belongs to the most diverse regions in Bavaria (Landschaftspflegeverbände Amberg-Sulzbach, 2010).

2.2 Conservation areas and biotopes

East of the quarry (cf. Annex 2) the nature reserves „Am Keilstein“ and „Südöstliche Juraausläufer bei Regensburg“ are situated. The nature reserve „Brandlberg“ adoins the quarry at the North. The nature reserve „Am Keilstein“ as well as the Fellinger Berg offer habitats for many species, especially for birds breeding in hedges and for bats. In 1990 and 2014, a Eurasian eagle owl (Bubo bubo) was spotted there. Around 650 m south of the quarry there is a European bird sanctuary called "Donau zwischen Regensburg und Straubing" (c.f.Annex 3) with nationwide important bird communities of meadow-breeding birds, wetland birds and waterbirds. The area serves as a very important resting and wintering ground. There are also some forests where different species of raptorial birds and woodpeckers are breeding (Bayerisches Landesamt für Umwelt, 2012).

The quarry Walhalla Kalk itself serves as an important retreat for sensible species in the context of growing land requirements for infrastructure, agriculture and industry.

Especially the following biotopes from the biotope mapping in 2010 (vgl. Annex 4) on behalf of HeidelbergCement, offer suitable habitats for rare cavity-nesting birds:

9. Steep face lower areas with willows and initial limestone semi-natural meadows

10. Steep face areas with weathering slopes

20. Biotope complexes of rock faces and lower levels/ quarry floor

(CBR Cementbedrijven N.V. , HeidelbergCement AG, 2014)

3. Aim of the project

During the extraction period, various and particularly rare stages of succession can be recorded in a quarry. Habitats with unique living conditions like open areas with rocky ground or steppe-like low-vegetation are created. Those heterogenic and dynamic habitats in quarries offer important substitute habitats as they have become very rare in our present-day cultural landscape. Suitable conservation measures are already useful during the quarrying (UMG Umweltbüro Grabher, 2013). Our aim is to develop a concept that joins both the local natural conditions of the project area and the ecological requirements of our management indicator species. The concept is also supposed to raise the qualifications of the quarry as a substitute habitat for cavity-nesting birds.

With this in mind, we took the following work steps during our project:

- Selection of management indicator species and identification of their habitat requirements

- Analysis of existing structures in the context of the demands of our management indicator species

- Preparation and realization of measures in the project area to optimize the quarry as a substitute habitat for our management indicator species and for various other species.

4. Selection of our management indicator species

The first question to ask ourselves was: For which threatened cavity-nesting birds can the quarry Walhalla Kalk serve as a suitable substitute habitat?

During the selection of suitable management indicator species we were aware to choose only species that already occurred in the quarry as we wanted to keep the risk of interspecific concurrence, thus the intervention in the existing ecosystem, as low as possible. Mappings from the HeidelbergCement AG from 2010 and 2013 as well as the species and biotope protection programme of the Bavarian State Office for Environment for the region Regensburg (ABSP, Regensburg, März 1999) and the book „Die Brutvögel der Stadt Regensburg“ from Schlemmer, Vidal and Klose (2013) served as basis for our research on present bird species in the project area and the surrounding.

Considering inter- and intraspecific concurrence and the conservation status as selection criteria, we chose the critically endangered Northern Wheatear (*Oenanthe oenanthe*) and the threatened Eurasian eagle owl (*Bubo bubo*) as suitable management indicator species out of all occurring bird species in the quarry and it’s surrounding. For both species, quarries have already become an important substitute habitat.

5. Presentation of the management indicator species and their habitat requirements

At the beginning of this Project, the most important question to answer was: For which endangered birds does the quarry “Walhalla Kalk” offer suitable substitute habitats? Based on literature researches on the incidence of birds which usually nests on cliff ledges, niches and caves in the quarry and their ecological requirements, “Walhalla Kalk” offers promising structures to be a qualified substitute habitat for the Northern Wheatear (*Oenanthe oenanthe*) and the Eurasian eagle owl (*Bubo bubo*). Mappings of HeidelbergCement AG from 2010 and 2013 as well as the book „Die Brutvögel der Stadt Regensburg“ von Schlemmer, Vidal und Klose, 2013 confirm the occurrence of those two threatened species in the Walhalla Kalk Steinbruch in Regensburg.

5.1. Eurasian eagle owl (*Bubo bubo*)

Figure 1 Adult bird, Eurasian eagle owl (Muukkonen, o.J.)

Characteristics
With a size of up to 70 cm and a maximum wingspan of 180 cm, the Eurasian eagle owl is the biggest owl species alive.

Population in Bavaria: 200-250 couples

Breeding
They do not make nests but breed in rock shelters. Breeding season starts in February and ends in June/July.

Habitat and lifestyle
The Eurasian eagle owl breeds in landscapes which are rich of structures and with a stock of tree that is not too thick. Its success in reproduction depends on the presence of enough open areas for hunting.

The Eurasian eagle owl is very faithful to a habitat. It is active at twilight and nocturnal.

Diet: This species is an opportunist concerning the prey. Its prey spectrum reaches from mice to rabbits and other birds and sometimes even amphibians.

Protection status and endangerment
Bubo Bubo is classified as threatened in the Bavarian red list and it's state of preservation in Germany is adverse/bad. The population of the Eurasian eagle owl still can't be considered safe as it depends on the continuation of protective measures. Quarries became very important substitute habitats for this species.

The most common endangerments are:

- Death because of collision with electric lines or in road- and rail traffic
- Disturbances close to the breeding place by leisure sports (climbing) or changes in the offer of food and the availability of prey do both influence the breeding success very negatively.

5.2. Northern Wheatear (*Oenanthe oenanthe*)

Figure 2 Male Northern Wheatear, (Bayerisches Landesamt für Umwelt, 2013)

Characteristics
The Northern Wheatear reaches a maximum size of 16, 5 cm. There is sexual dimorphism between male and female birds

Population in Bavaria: 50-120 couples

Habitat and lifestyle
Oenanthe oenanthe prefers open or half-open landscapes with steppe-like character on dry, sandy ground. There should also be a sufficient offer on rocky hillsides with hollows and cracks for their nests and several high song posts. It is a long-distance migrant that overwinters in Africa south of Sahara

The Northern Wheatear is active at daylight

Diet: Mainly insects, spiders, worms and snails, sometimes berries in autumn

Breeding
Builds a nest in hollows and cracks on the ground or in rocks, roots, clearance cairns. Breeding season lasts from May until middle of August.

Protection status and endangerment
The Northern Wheatear is classified as critically endangered both on the Red List of Germany and the Red List of Bavaria. The species‘ state of preservation is considered as adverse/bad in Germany. Quarries became very important substitute habitats for this species.

Endangerments:

- Change and destruction of habitats, especially because of intensive agricultural use of the landscape
- Lower variety in their food because of biocidal applications in agricultural areas, on railway embankment and waysides
- Climate and landscape changes in their wintering grounds

6. Analysis of existing structures and deficits

The quarry Walhalla Kalk features different stadiums of quarrying and succession. You can find parts of the quarry, like the upper berms, that are already out of use for 25-30 years and abandoned to the course of natural succession. Mining currently takes place up to four times a week, mainly in the central western part of the quarry. We created the following status map (see Fig. 3) on the basis of our own mappings (from 17.01.2014) and aerial pictures (Google Earth, 09.02.14) of the project area.

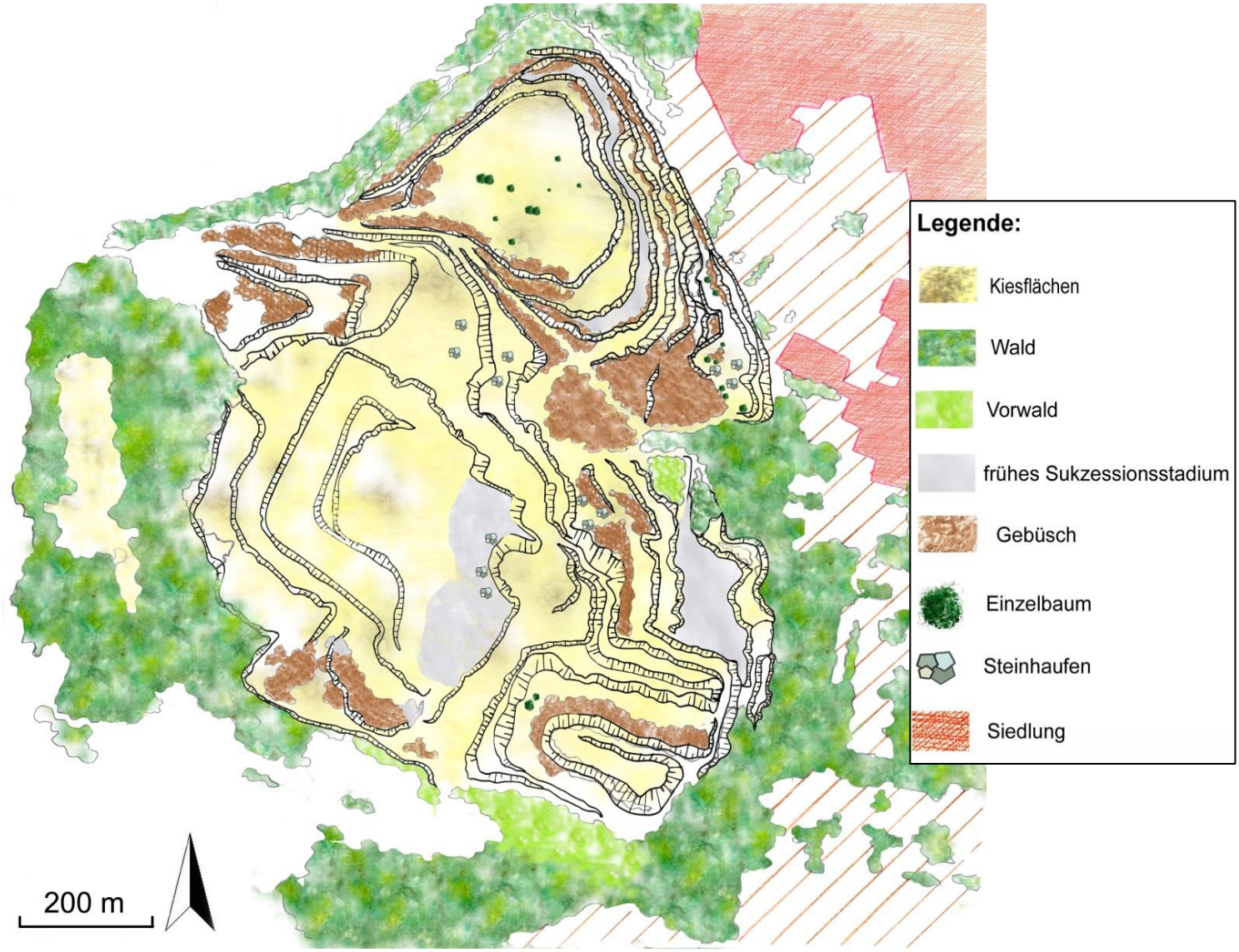


Figure 3 Status map of the quarry Walhalla Kalk in Regensburg (author with use of an aerial image from the BayernAtlas, Bayerische Vermessungsverwaltung 2014)

Mapping of present bird species

Additional to the analysis of the local habitat structures at the Walhalla Kalk quarry in Regensburg it is important for our project to list all the occurring birds in this area. The temporarily list is based on the literature of former surveys of the HeidelbergCement AG (2010,2013), the species and biotope protection programme of the Bavarian State Office for Environment for the region Regensburg (ABSP, Regensburg, März 1999) as well as the new published book „Die Brutvögel der Stadt Regensburg“ written by Schlemmer, Vidal und Klose (2013). According to the quarry information of the Walhalla Kalk GmbH & Co. KG, both the Northern wheatear and the Eurasian eagle owl were listed in 2013. To confirm these data, we recorded birds during a survey with the local ornithologist Dr. Richard Schlemmer on April the 30th. Encountered birds were recorded on the following map, using one number for each bird. Unfortunately, our shy indicator species did not appear during this survey. Instead we could confirm the presence of several other endangered, red listed species like the Woodlark (*Lullula arborea*), the Common Whitethroat (*Sylvia communis*) as well as the Little Ringed Plover (*Charadrius dubius*). Furthermore we were able to identify important and rare habitat structures for the endagered Eurasian wryneck (Jynx torquilla). The areas with low vegetation in our quarry are not only suitable as potential breeding habitats for the Northern Wheatear. They are equally important for the occurrence of ants like the black garden ant (*Lasius niger*) that we found, which is the main source of food for the Eurasian wryneck. As we are considering more than just supporting our indicator species with our measures but also the whole Fauna and Flora in the quarry, it is very important to maintain these rare habitats.Later on, we received sufficient evidence that the Eurasian eagle-owl occur in the quarry Walhalla Kalk: Our indicator species has been sighted several times and could be identified by its characteristic birdsong at dusk by the local tenant of hunt.

In order to ensure a support of the populations of the endangered Northern Wheatear (*Oenanthe oenanthe*) and Eurasian eagle owl (*Bubo bubo*) in the quarry in the long term, we want to show the existing structures as well as the deficits of the project area concerning the species' existence in the long-term.

Therefore we interrelated in the following, information from our own mappings with the ecological demands (cf. chapter 5) of the birds to ascertain the necessary actions to be taken.

Northern Wheatear (*Oenanthe oenanthe*)

The following ecological demands of the Northern Wheatear are currently fulfilled in our project area:

- Open areas of rocky raw soil and areas with steppe-like low-vegetation for hunting (c.f. Annex 7)
- Hollows and cracks on the ground or in rocks as well as cairns for nesting.
- Single trees or other high structures suitable as song posts

Regarding the ecological demands of the Northern Wheatear, we detected the following deficits in the project area:

- Too little blossomy structures that function as food source for insects (an adequate variety of wildflowers ensures a sufficient food availability for the Northern Wheatear)
- So far the there is no care concept provided for the areas. As a consequence there is a high risk of scrub encroachment in the open areas which results in population decline of the Northern Wheatear population and of other species that prefer steppe-like low-vegetation, in the long term
- There is no resting area defined in order to save this sensible species from disturbances and stress due to machinery operations or human activity. This is most important during breeding season (May until middle of August)

Eurasian eagle owl (*Bubo bubo*)

The following ecological demands of the Eurasian eagle owl are currently fulfilled in our project area

- Sufficient supply of escarpments and steep faces, niches, cavities and cliffs (c.f.Annex 7)
- Richly structured landscape with a stock of tree that is not too thick

Regarding the ecological demands of the Eurasian eagle owl, we detected the following deficits in the project area:

- Lack of habitats with dense and species-rich vegetation cover for the prey (small mammals) and with enough hunting corridors for the owl in between. Especially wildflower fields offer a high amount of niches and capacities of protection.
- So far the there is no care concept provided for the areas. As a consequence there is a high risk of scrub encroachment in the open areas needed for hunting.
- There is no resting area defined in order to save this sensible species from disturbances and stress due to machinery operations or human activity. This is most important during breeding season (February - June/July).

A steppe-like low-vegetation area for hunting, a huge area of rocky raw soil and early stage of succession are the limiting factors for the territorial claims of the Northern Wheatear. These factors and an adequate variety of wildflowers (involving insects, worms and spiders which are the staple diet of the Northern Wheatear) will ensure a sufficient food availability. The area at the north-east of the quarry is particularly qualified for a breeding area as it is already out of use. After a bird survey with a local ornithologist several cairns could be located as potential breeding sites almost everywhere in the quarry.

Escarpments and steep faces which provide protection against wind and rain are the limiting factor for the Eurasian eagle owl. Therefore steep faces in the south-east of the quarry are qualified breeding areas.

In consideration of the detected deficits in the project area, we developed various measures to protect and support the populations of our management indicator species in the quarry Walhalla Kalk. This concept of measures is presented in the following chapter:

7. Concept of measures

To optimize the project area according to the ecological demands of our management indicator species, a breeding area for each species shall be developed in areas of the quarry that are already out of use. An area of 8200 m² with rocky raw soil in the north-east of the quarry is qualified for a breeding area for the Northern Wheatear. Steep faces in the south-east of the quarry are qualified breeding areas for the Eurasian eagle owl. Both potential breeding areas are out of use which makes it easier to designate them as sanctuaries. Additionally we planned to develop a hunting area with open fields for hunting on one hand and with wildflower areas to increase the population density of the prey.

At first, we are presenting the actions to be taken to develop the breeding habitats.

7.1 Breeding habitat

Together with a local ornithologist, we could locate plenty of potential breeding sites for the Northern Wheatear in the quarry which occur among others through vehicle operation at work. But these areas of rocky raw soil and steppe-like low-vegetation have one foe: Time. Because as time went by, habitats once suitable for the Northern Wheatear get lost as a result of succession in areas that are out of use. As a consequence, the population declines. The same effect occurs with the Eurasian eagle owl that needs open areas for hunting. Furthermore both species react very sensible towards disturbances, especially during breeding season. As the quarry is still in use, precautions have to be taken to avoid disturbances and stress (for example due to machinery operations or human activity) for the nesting birds.

We propose the following measures to be taken to improve the project area according to the ecological requirements of the Northern Wheatear and Eurasian eagle owl for a long time:

1. Maintaining open areas with work's own vehicles driving over the ground to disturb vegetation growth. This measure should be realized in winter to avoid negative effects on the soil fauna (Anders, Mrzljak, Wallschläger, & Wiegleb, 2004, S. 147). As succession runs slow in the nutrient-poor soils of the quarry, it has to be performed only once every 10-25 years. As this measure can be carried out as a joint product of the casual operations of quarrying, it is very effective at minimal costs and burden.

2. Preservation of several cairns to breed for the Northern Wheatear.

3. Preservation of high single trees as song posts for the Northern Wheatear.

3. Preservation of the steep faces southeast of the quarry as suitable breeding sites for the Eurasian eagle owl. If necessary, deepen some rock shelters in the steep faces manually.

4. Establishment of protected areas for breeding birds.

7.3 Hunting area

In this chapter we want to introduce you to our measures to develop the hunting areas and raise the food availability for the endangered Northern Wheatear (*Oenanthe oenanthe)* and Eurasian eagle owl (*Bubo bubo*).

As mentioned previously the limiting factor for the Northern Wheatear is the sufficient food availability consisting of insects, worms and spiders which are to be found in species rich calcareous low-nutrient meadows. For the Eurasian eagle owl the hunting area is supposed to be several hectare large with both open fields for hunting and with wildflower areas to increase the population density of the prey. As evidenced by several studies, small mammals favor dense and species-rich wildflower areas as habitats because they offer them many niches and capacities of protection (Arlettaz, Krähenbühl, Almasi, Roulin, & Schaub, 2010, S. 9).

Therefore, we install a 9 ha large hunting area with open fields for hunting on one hand and with wildflower areas to increase the population density of the prey on the other hand. The installation of two wildflower areas with different extent and a wide range of species will increase the food availability of small mammals and insects and raise the structural diversity in the quarry:

1. Species rich calcareous low-nutrient meadow to raise the population density of insects

2. Dense and species-rich wildflower meadow to raise the population of mammals

Because these meadows grow are along linear structures in the quarry, edge effects occur and support the access to the prey for the Eurasian eagle owl. Additionally, the flowerstrips serve as directing structures which supports the immigration of species into the project area.

To fulfill the characteristics and natural conditions of the quarry, it is very important to use only regional seeds. In agreement with the environment agency of Regensburg, we decided to use mowing material from the adjacent FFH biotopes to avoid the risk of adulteration of flora. In the surrounding North West of the quarry, several rare wildflower meadows are located. In consultation with the local environment agency and the Landschaftspflegeverband Regensburg, the approval of certain areas could be obtained. To ensure that no invasive species and weeds are growing in the donor plots we visited the selected meadows and mapped the present flora. Finally we got the permission to cut the selected areas 3 and 8 (c.f. Annex 9). Especially the dry and open sites are appropriate for the low-nutrient meadow, whereas the nutrient rich structures on the edge were our source for the dense, species-rich wildflower meadow.

Thanks to the Landschaftspflegeverband Regensburg, involved farmers and the quarry operator Herr Schröder, we could successfully sew the mowing material from the adjacent FFH biotopes in the hunting area in middle of August (c.f. figure 4).

Figure 4 Sowing of the mowing material from the adjacent FFH biotopes in august

As the calcareous low-nutrient meadow grows on nutrient-poor raw soil in our project area, measures for soil improvement like fertilization are not necessary and should even be avoided (Ministerium für Ländlichen Raum und Verbraucherschutz Baden-Württemberg, o.J.). This saves costs and time.

As needed, the meadows can be cut once after one or two years, between July and September. The mewing should be arranged in a staggered manner to leave some structures standing to serve as hiding places for the animals. Flowerstrips of different ages and heights also raise the biodiversity as different species prefer various stadiums (Deutsche Bundesstiftung Umwelt, 2002).

7.4 Other species supported by our measures

Our measures have potential to support other species with high relevance for nature conservation as well. The Northern Wheatear with it's specialized mode of life also acts as an umbrella species (Anders, Mrzljak, Wallschläger, & Wiegleb, 2004, S. 176). Where he occurs you can often find other geobiotic birds that need the dry grounds with low-vegetation as food source or for breeding. Examples are the countrywide threatened species Tawny Pipit (*Anthus campestris*), Hoopoe (*Upupa eopos*), Nightjar (*Caprimulgus europaeus*), great grey shrike (*Lanius exubitor*) and Woodlark (*Lullula arborea*).

Furthermore, keeping the areas open creates habitats for many psammophilic arthropods like wasps, ground beetles, grasshoppers and spiders of sandy habitats (Anders, Mrzljak, Wallschläger, & Wiegleb, 2004, S. 147).

The flowerstrips in the hunting area offer attractive habitats not only for small mammals but also for different pollinators. This raises the biodiversity of bees, bumblebees, hoverflies and butterflies.

8. Résumé

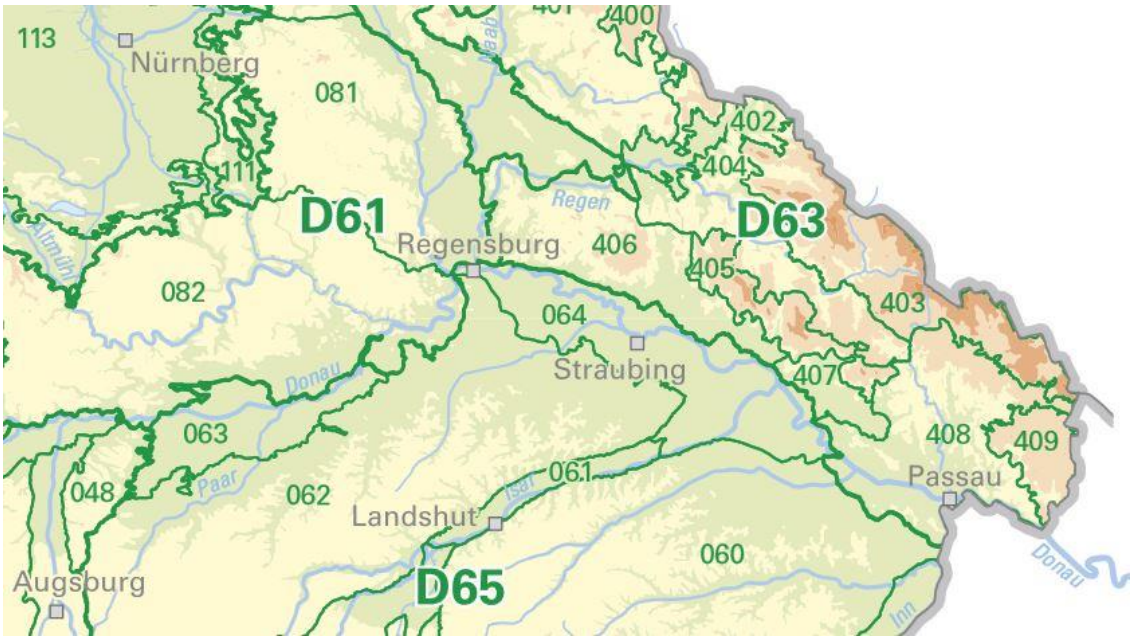
While working on our conservation concept it was of highest importance for us that the measures practicable and realistic. We also aimed to keep the interventions in the already existing nature in our project area as low as possible. The intensive support of certain species in the context of nature conservation is always an intervention in the existing ecosystem and should be realized carefully. For that reason we intensively analysed the already existing structures in our project area and developed our measures for species that are already present in the quarry. We also did not consider the project area as a closed system but included the surrounding and it's natural features in our strategy.

Thanks to the cooperation and consultation with the Landschaftspflegeverband and the environment agency in Regensburg we managed to see autochtonous mowing material from nearby FFH areas.

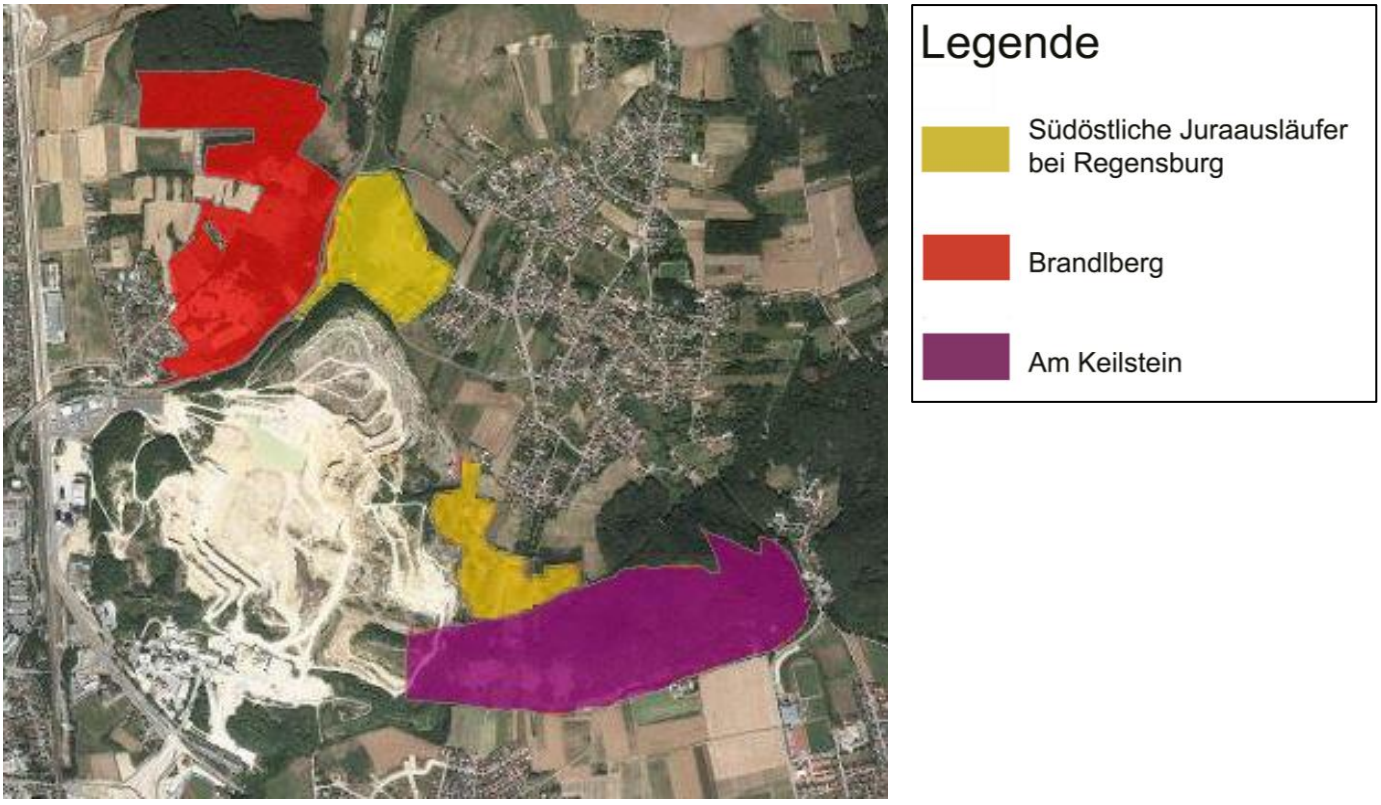
As our management indicator species the Northern Wheatear and the Eurasian eagle owl react quite sensible towards human disturbances they have more and more problems in finding suitable breeding habitats in Germany. That's why especially quarries as substitute habitats have a high potential for measures to conserve and support these rare species in Germany. We hope that we were able to successfully use this potential during our project for the Quarry Life Award and we are curious about the results of our work.

To guarantee optimal conditions for a high biodiversity in the project areas we recommend a regular detection of the condition of the project areas in the long-term via monitoring.

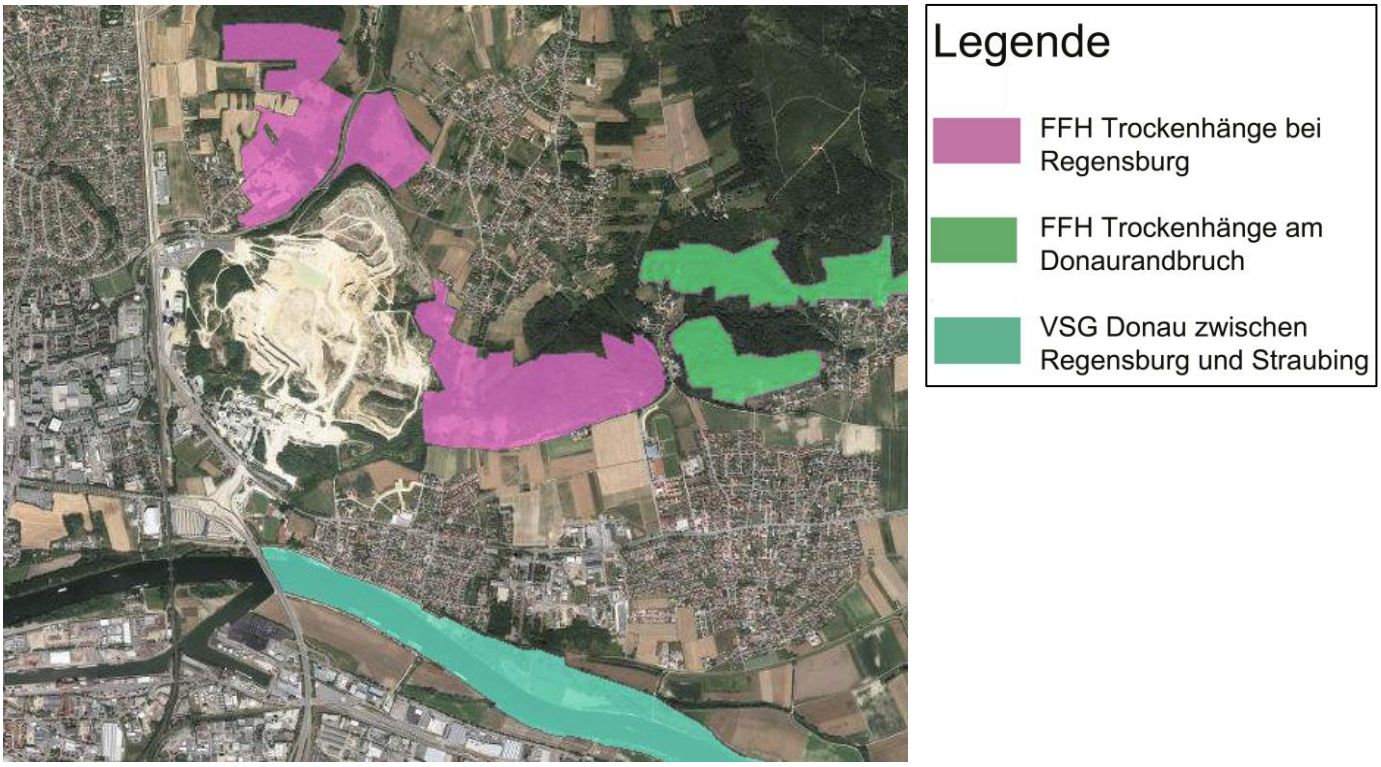
Annex



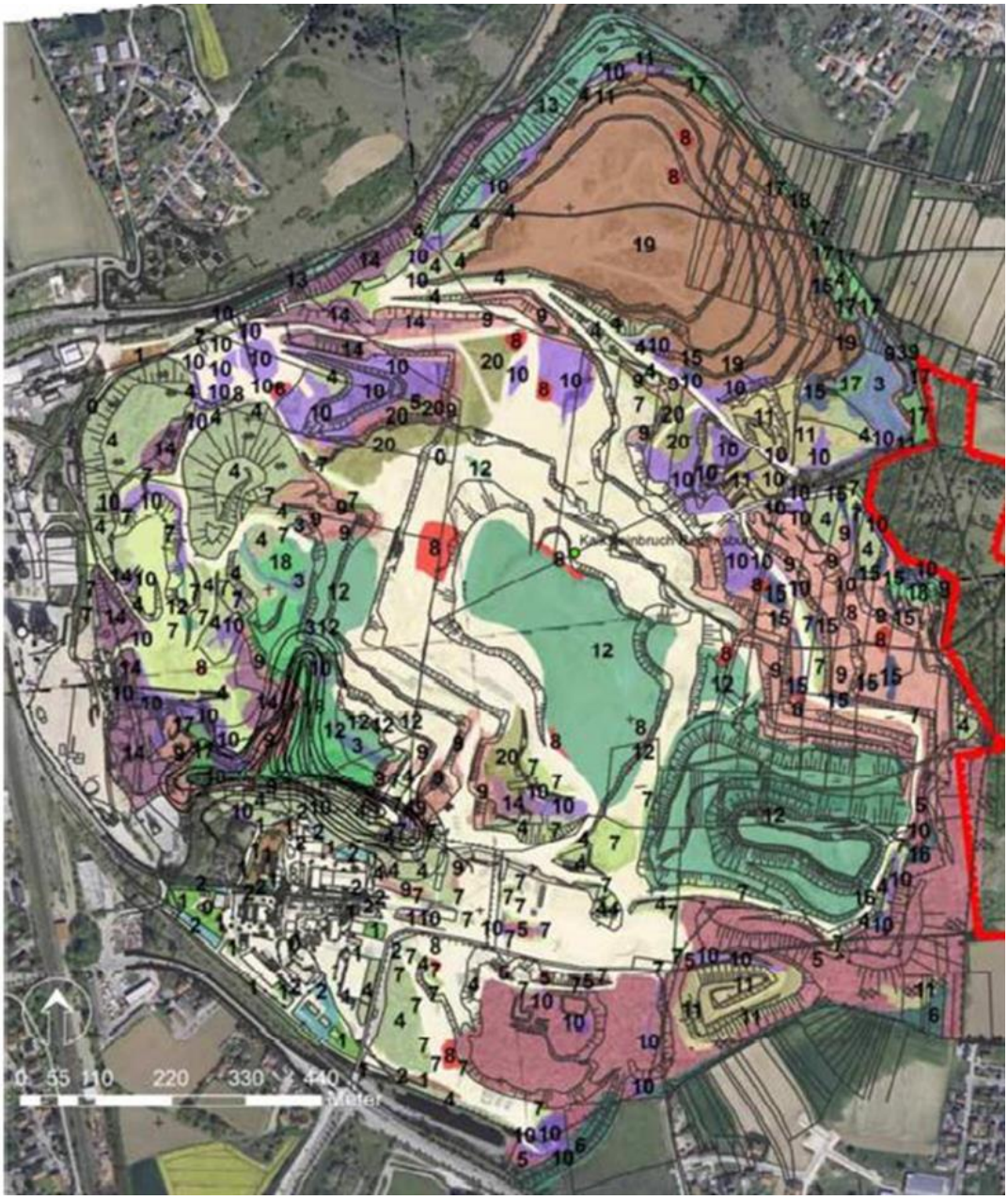
Annex 1: Angrenzende Naturräume der Stadt Regensburg (Landschaftspflegeverbände Amberg-Sulzbach, 2010)



Annex 2: Annex 2: Naturschutzgebiete, M 1:25000, Verfasser nach der Karte vom (Bayerischen Landesamt für Umwelt, 2012)



Annex 3: FFH-Gebiete, M 1:25000 (Bayerisches Landesamt für Umwelt, 2012)

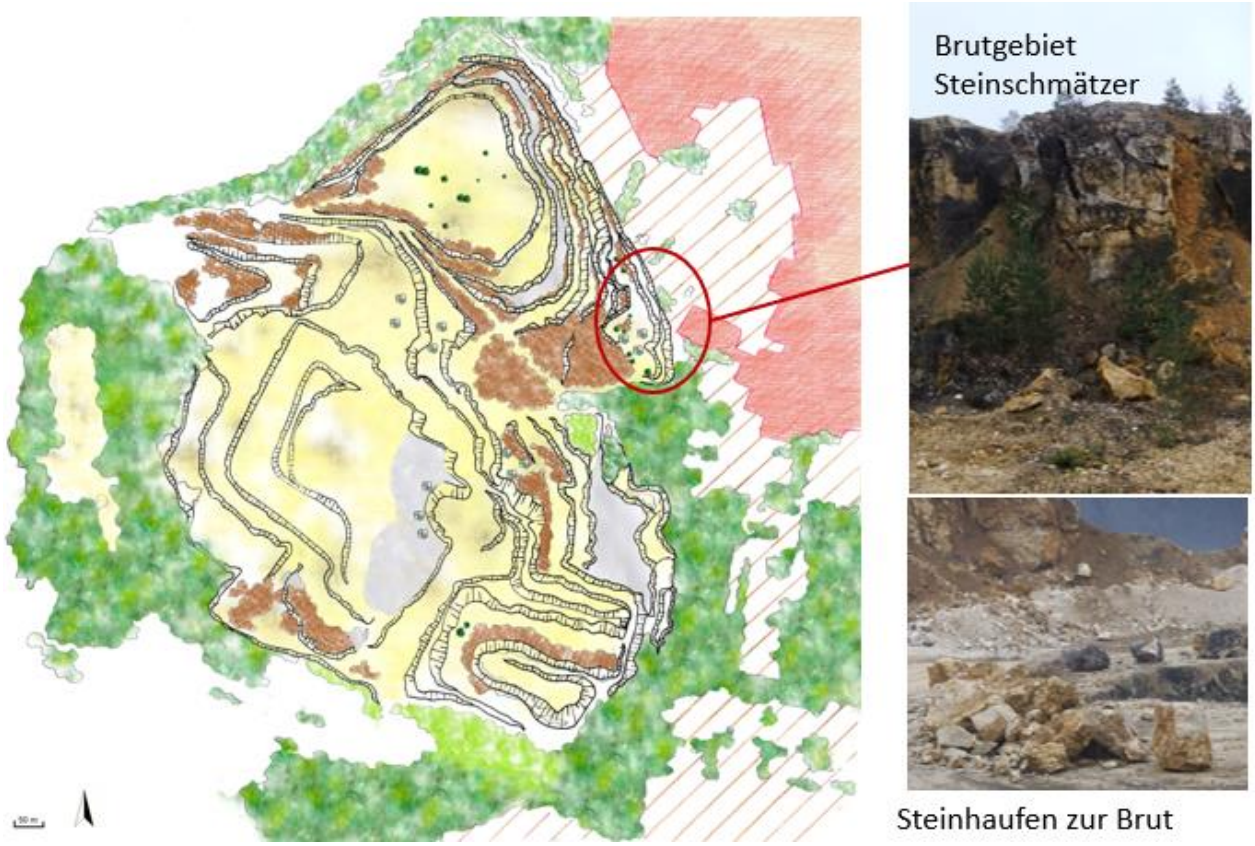


Annex 4: Biotope im Walhalla Steinbruch (HeidelbergCement GmbH, August 2010)

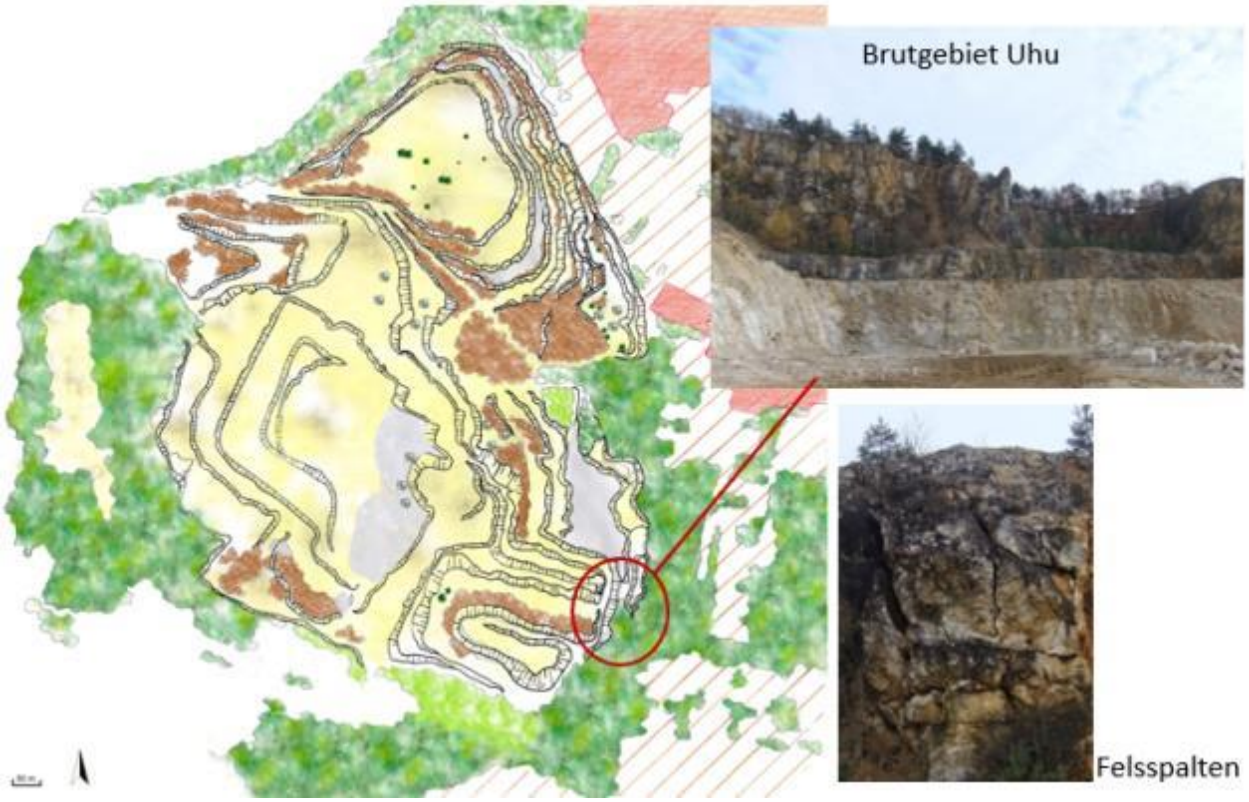
Für unser Projekt besonders relevante Biotope:

- 9. Steilwand-Sohlenbereiche mit Weidengebüschen und initialen Kalk-Magerrasen
- 10. Steilwandbereiche mit Verwitterungshalden
- 20. Biotopkomplex aus Felswänden und Sohlen

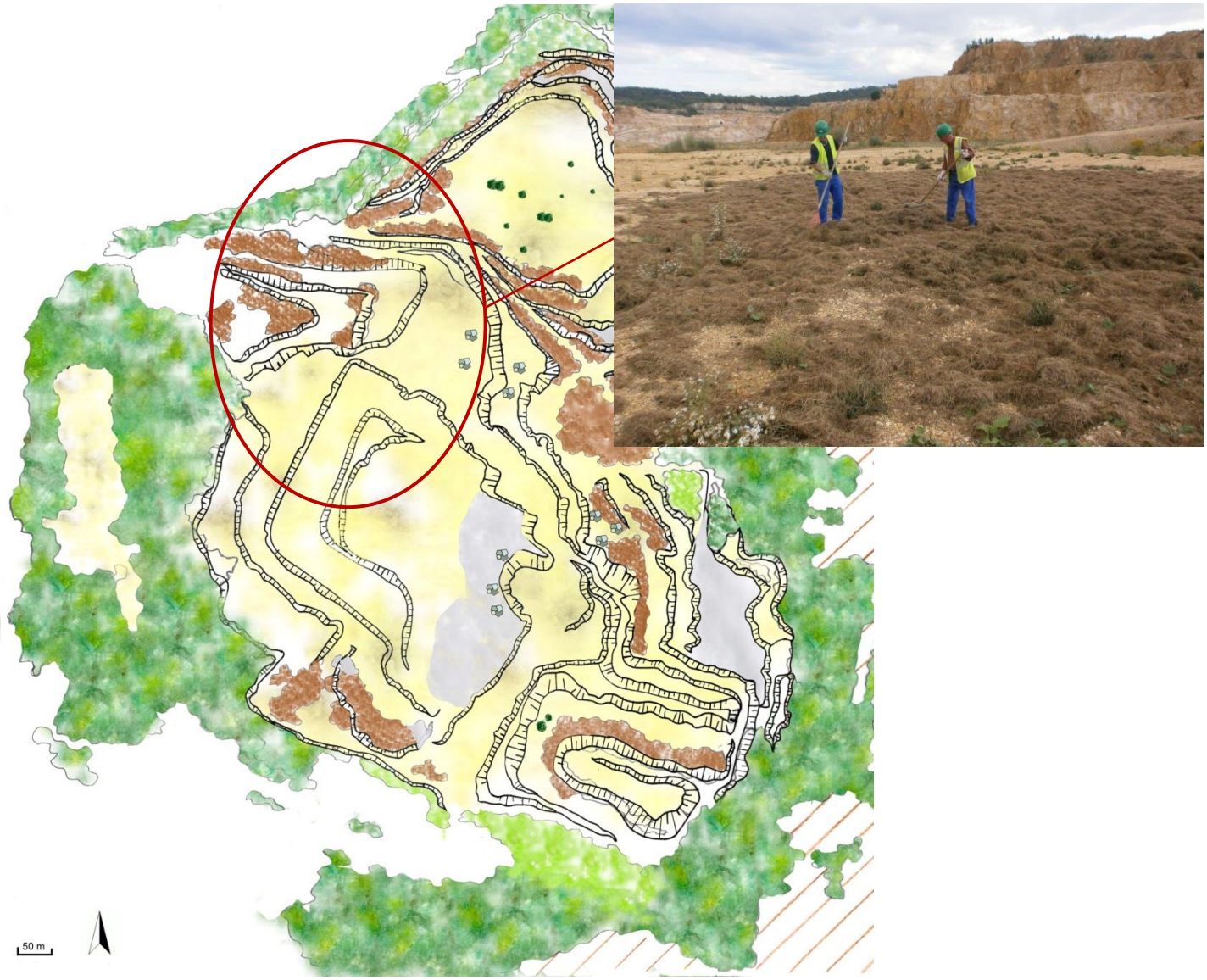
Annex 5: Kartierung vom 30.04.2014 mit Herrn Dr. Schlemmer



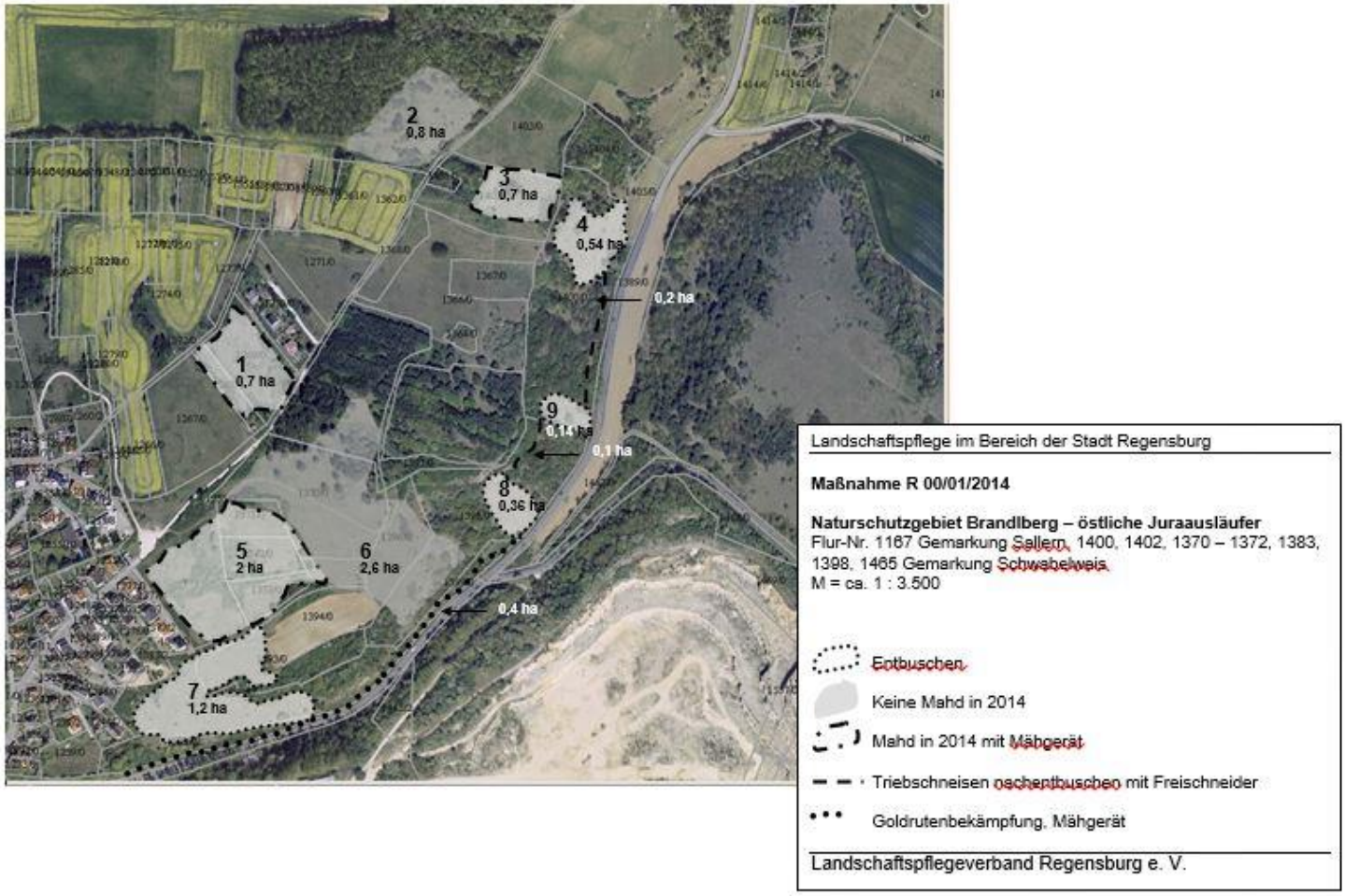
Annex 6: Potentielles Brut- und Jagdhabitat des Steinschmätzers



Annex 7: Potentielles Bruthabitat Uhus im Nordosten des Steinbruchs



Annex 8: Ausgewählte, aus der Nutzung genommene Fläche zur Mähgutübertragung, Quelle Verfasser (bereitgestellt von Herrn Schröder (Leitung Steinbruch Walhalla Kalk)



Annex 9: Flächen, die vom Landschaftspflegeverband zur Mahd freigegeben wurden (bereitgestellt von Frau Wagner, Landratsamt Regensburg)

Annex 10: Spenderfläche Nummer 8 (vgl. Annex 10) (© Markus Bauer 14.07.2014

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