PALLAS

PUBLIC

Memorandum of Notification Strategic Environmental Assessment

January 2016

Contents

1 General

1.1 Background

The Foundation Preparation Pallas reactor *(Stichting Voorbereiding Pallas-reactor)* hereinafter referred to as PALLAS, intends to build a multifunctional nuclear reactor designed to produce medical and industrial isotopes, and to perform technological nuclear research. This reactor, hereinafter referred to as the PALLAS reactor, will serve as a replacement for the current High Flux Reactor (HFR) in Petten, which has currently been operational for more than fifty years and is approaching the end of its economic life. Since the end of 2013, PALLAS has been incorporated in the Foundation Preparation Pallas reactor. The objective of PALLAS is: to realise the first phase (invitation to tender, design and permits) and to attract private financing for the second phase (construction and commissioning of the reactor). To this end, PALLAS obtained an 80M € loan from the Ministry of Economic Affairs and the Province of North Holland (40M € each). ■

Figure 1

Map of North Holland North showing enlarged the Petten Research Location (Onderzoekslocatie Petten - OLP)

1.2 Why this memorandum of notification SEA?

For its permit process, PALLAS will draft two Environmental Impact Reports, these are the Environmental Impact Report (EIR) and the Strategic Environmental Report (SER). These Environmental Impact Reports are linked to the zoning plan procedure and the permit procedure for the Nuclear Energy Act respectively. These procedures will not run simultaneously, because the information required about the PALLAS-reactor design for the separate procedures will not be available at the same moment. The zoning plan procedure and with it the SER will be followed earlier than the Nuclear Energy Act

Figure 2

Memorandum of Notification for the Decision-EIA procedure (in Dutch)

permit procedure. The contents of the SER and the EIR will be aligned to each other. The EIA procedure linked to the Nuclear Energy Act permit application has already started with the publication of a Memorandum of Notification, which was available for inspection from 4 June up to and including 15 July 2015.

The current Memorandum of Notification has been drawn up for the SEA linked to the change to the zoning plan. The current zoning plan of the location allows for no major changes (www.ruimtelijkeplannen.nl; determined 07-2015; NL.IMRO.0441.BPBGZIJPE-VA02), which means that this zoning plan does not allow for the desired realisation of the PALLAS reactor. In addition, the boundary for nuclear activities must be amended so that it includes the entire intended location of the PALLAS reactor. The SEA will map out, at a global level appropriate for the detail level of the zoning plan, the environmental impact related to the construction of the PALLAS reactor on the Petten Research Location *(Onderzoekslocatie Petten - OLP)*.

The change to the zoning plan requires a SEA as a consequence of the Environmental Impact Assessment Decree (Annex Environmental Impact Assessment Decree Activity C 22.2). In addition, an EIA Procedure must be followed because a Suitable Assessment *(Passende Beoordeling)* must be drawn up (see Suitable Assessment below) for the zoning plan. ■

Suitable Assessment

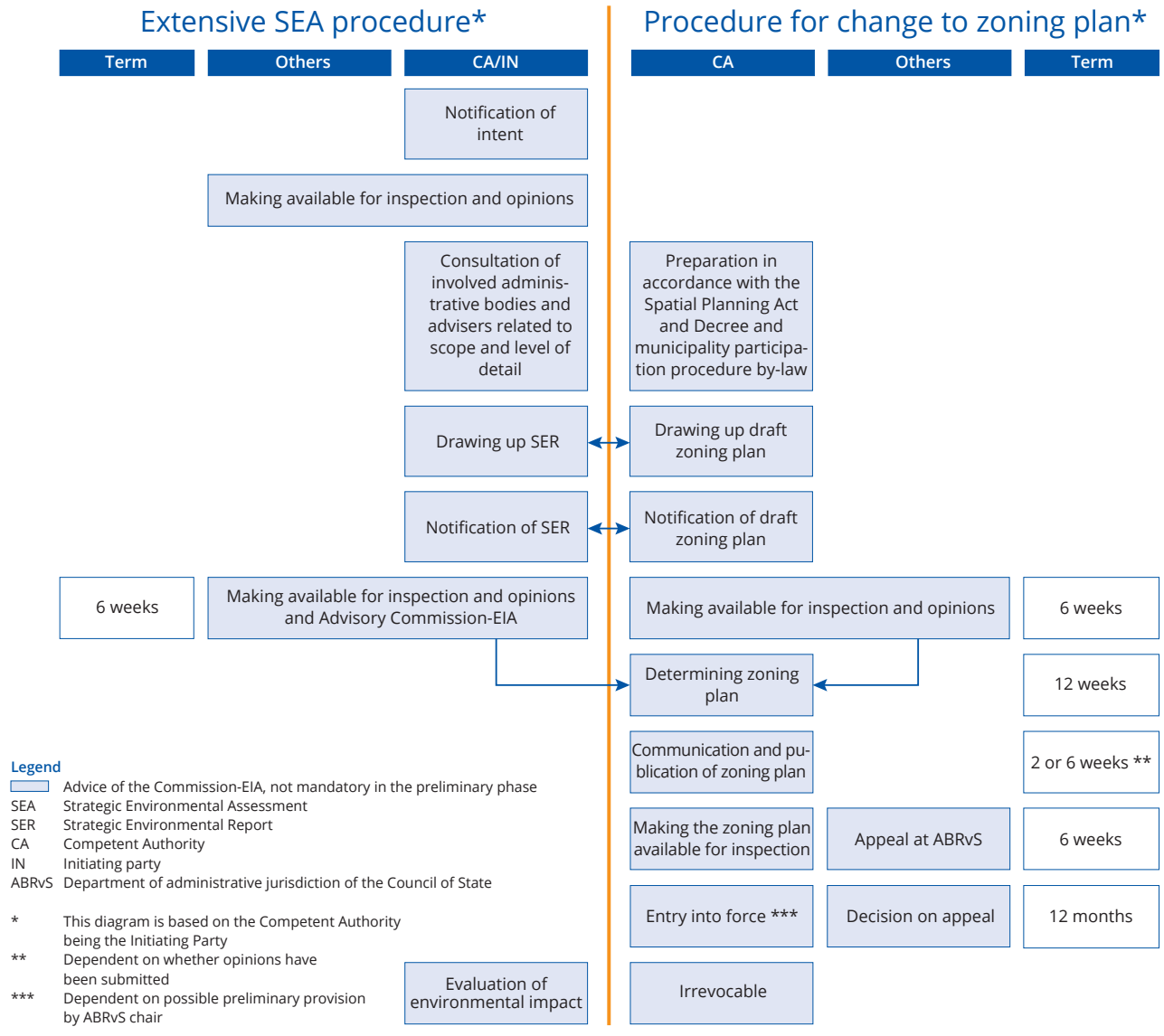
The planned area for the PALLAS reactor borders the Natura 2000 areas North Sea coastal zone and Zwanenwater & Pettemer dunes, for which the protection regime of the Nature Conservation Act applies. These areas can be affected, for instance, due to nitrogen deposition or sound during the construction phase. Because the zoning plan can conflict with the maintenance objectives of Natura 2000 areas, a 'Suitable Assessment' will be drawn up based on the Nature Conservation Act. PALLAS has chosen to draw up a Suitable Assessment immediately and not to determine whether this is actually necessary based on a Pre-Assessement. The Suitable Assessment has the same level of abstraction as the SEA.

1.3 SEA procedure

This SEA procedure serves to support the decision-making process relating to the change to the zoning plan. The objective of the SEA procedure is to take full account of the impact the intended development will have on the environment in the decision-making process. An extensive procedure must be followed for the SEA. In this SEA procedure, the Schagen municipality is the Competent Authority.

The SEA procedure consists of a number of steps. Figure 3 shows the link between the (extensive) SEA procedure and the procedure for changing the zoning plan. Following this figure, a short explanation is given of the steps to take in the EIA Procedure.

Figure 3



Extensive SEA procedure linked to the zoning plan change

Notification, making available for inspection, consultation of involved administrative bodies

The first phase of the SEA procedure focuses on delineating and identifying the intended approach in the SEA, the possibility for everyone to submit opinions and the consultation of the involved administrative bodies and the legal advisers. This phase starts by publishing a public notification that explains that an SEA procedure will be followed relating to the change to the zoning plan and that opinions can be submitted. No legal requirements exist for obtaining advice and opinions. Although it is not mandatory to obtain the advice from The Netherlands Commission for Environmental Assessment (NCEA) in the preliminary phase, the Competent Authority (the Schagen municipality) decided to do so in the interest of a prudent procedure and with an eye to the sensitivity of this project. NCEA is requested to issue its advice based on this Memorandum of Notification regarding the scope and the level of detail of the SEA for PALLAS.

This Memorandum of Notification will be made available for inspection for a period of six weeks. During this period, everybody has the opportunity to submit their opinions regarding the proposed approach to the SEA that will be drawn up and/or to issue advice about its scope and level of detail. In addition, in this phase, the NCEA will be asked to issue advice about the scope and the level of detail of the SEA .

Drawing up the SEA

The environmental assessment will be performed and the SEA drawn up in accordance with the proposed scope and level of detail. Where possible and useful, account will be taken of the submitted opinions, reactions and advice.

Public notification, consultation, advice and decision

As soon as the SEA is completed, the Competent Authority will publicly announce the SEA. The SEA will then be available for inspection for six weeks, at the same time as the draft zoning plan. In this period, anyone is able to submit opinions relating to the SEA. The NCEA will also assess the SEA. This independent commission assesses whether all of the information is present in the SEA to be able to take full account of the environment in the decision-making process relating to the zoning plan. Here it also uses the received opinions relating to the SEA. The final zoning plan will be drawn up in part based on the results of the SEA, taking into account the opinions and the advice of the NCEA. ■

1.4 Other relevant decisions

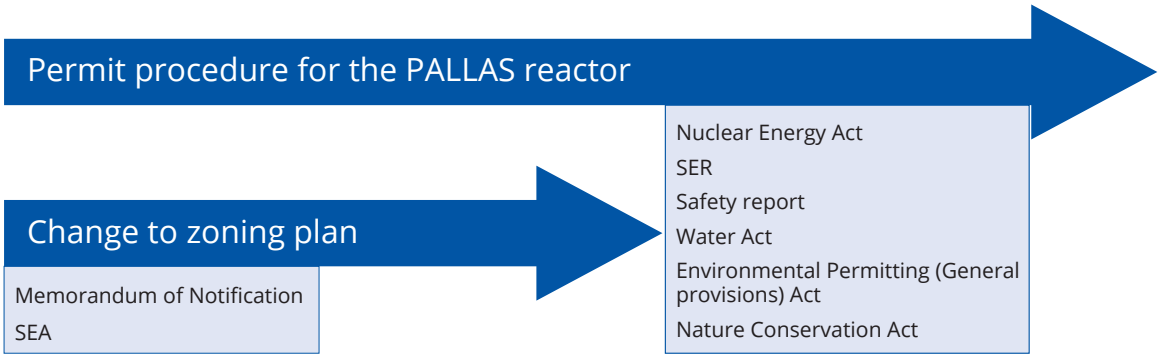
In addition to changing the zoning plan and the associated SEA procedure, permits are required for the realisation of the PALLAS reactor. Those with the most weight are the permits based on:

- The Nuclear Energy Act (Dutch abbreviation KEW) for establishing and operating the PALLAS reactor. An important part of the application for the KEW-permit are the Environmental Impact Report (EIR) and the Safety report (Dutch abbreviation VR)

- The Water Act for all direct water discharges.
- The Environmental Permitting (General Provisions) Act for the location-bound activities, including construction, installation and use.
- The Nature Conservation Act for the protection of nature reserves (Natura 2000).

Figure 4 shows in outline the relationship between the change to the zoning plan and the permit procedures. ■

Figure 4



Relationship between change to the zoning plan and the PALLAS permit procedures

1.5 Parties involved

Initiating party

The initiating party is responsible for drawing up this Memorandum of Notification and the SEA. The initiating party is PALLAS:

Stichting Voorbereiding Pallas-reactor
Postbus 1092
1810 KB Alkmaar

Competent Authority

The Competent Authority responsible for drawing up the zoning plan and the SEA is the City Council of the Municipality of Schagen.

Gemeente Schagen
Postbus 8
1740 AA Schagen

Commission for the EIA

The NCEAis an independent advisory body. For every EIA Procedure, the NCEA appoints a working group comprising its members. For this SEA, the NCEA will be requested to appoint the same working group as for the EIA. This working group advises the Competent Authority regarding the scope and level of detail of the SEA that will be drawn up and about the completeness, correctness and quality of the plan. ■

2 Objective, intended activity and variants

2.1 Objective

The objective of PALLAS is to realise a multifunctional reactor on the Petten Research Location *(Onderzoekslocatie Petten - OLP)* that is suitable for the production of medical isotopes, industrial isotopes and to perform technological nuclear research. This reactor, the PALLAS reactor, will serve as a replacement for the current High Flux Reactor (HFR) in Petten, which has currently operated for more than fifty years and is approaching the end of its economic life. The current zoning plan for the OLP must be changed to make it possible to realise the PALLAS reactor. The objective of the SEA will be to address the environmental consequences to ensure that environmental aspects are sufficiently taken into account in the decision-making process relating to the zoning plan. ■

2.2 Intended activity

PALLAS intends to build a new multifunctional nuclear reactor and to operate it to produce medical and industrial isotopes and to execute public and private technological nuclear research. The project concerns the construction of the PALLAS reactor and the installation of all of the provisions it requires.

The location is situated in the Schagen Municipality at the OLP.

The OLP (see photo) houses multiple organisations. These are: NRG, ECN, Mallinckrodt Medical B.V. and JRC – Institute for Energy and Transport (a European Commission joint research centre).

Figure 5

Aerial photo of the OLP

The intended activity does not deviate from the one mentioned in the Memorandum of Notification for the Decision-EIR on the understanding that the SEA will focus on the environmental information required to specify the zoning-plan aspects of the new multifunctional nuclear reactor. The permit application and the associated Decision-EIR address the actual (technical) aspects and the execution of the intended activity and the associated environmental effects and the measures that must be taken.

The SEA will elaborate the outline of the following activities:

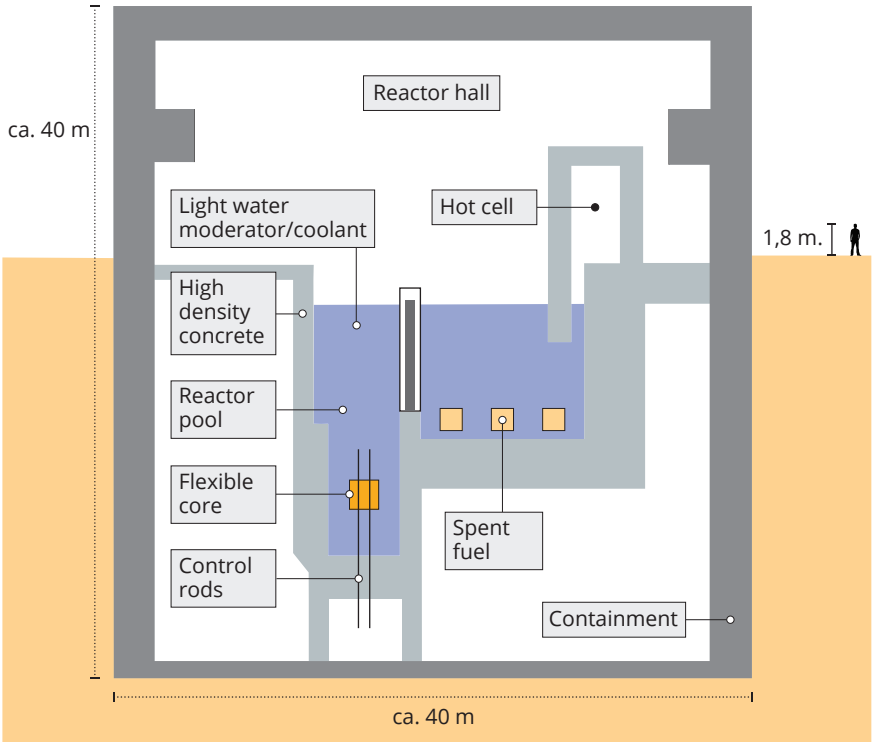
- The use and necessity of the PALLAS reactor.
- The steps prior to the building and after the operation of the reactor (including the production of nuclear fuels or the processing of nuclear waste), which are not part of the intended activity.

The reactor building is expected to cover approximately 40 x 40 metres. Around the reactor building, access roads and several smaller buildings will be built for provisions including electricity supply, pumping station, offices and surveillance. The whole will be surrounded by fencing. The characteristics of the intended activity that are relevant for the zoning plan and the SEA that will be drawn up are described below.

The PALLAS reactor

The PALLAS reactor will be, like the existing High Flux Reactor (HFR), a 'pool-type' (see Figure 6). In this design, the reactor tank containing

Figure 6



Schematic representation of a pool-type reactor

the reactor core is installed in a large water pool. The reactor tank offers room for nuclear fuel elements, which produce neutrons, and control rods, which absorb neutrons and by doing so control the nuclear fission.
The major advantage of a 'pool-type' reactor is that the pool provides sufficient screening to be able, during normal operations, to safely load and unload experiments and irradiated isotopes into and out of the reactor core.

Cooling

During the fission of the uranium atomic nuclei, heat is released that is removed by cooling the reactor core. The heat is transferred to the cooling water that flows through the reactor tank. The cooling water is pumped around the primary cycle. A heat exchanger transfers the heat absorbed in the primary cycle to a secondary system. This secondary system extracts fresh cooling water from a nearby surface water source and after being heated, it discharges it to the same or some other surface water. The primary and secondary cycles are physically separated. The reactor core and the nuclear fuel that is used also release heat to the pool water. The pool water is cooled in a similar way to the cooling water.

Various options can be considered for the extraction and discharge of the cooling water. These are described in Section 2.4. ■

2.3 Scope of the plan-SEA

The SEA will be drawn up for the zoning plan procedure. To be able to make a decision about the zoning plan, it must be clear that the intended activity is feasible at the intended location. At the abstraction level of the zoning plan and without the exact design of the reactor being known, the SEA will indicate what environmental impact can be expected as a result of the intended activity and the variants. The SEA will compare the environmental impact of the variants and will give information about possible problem areas and points that must be considered from the viewpoint of the environment for the further planning within the context of granting permits.

Choice of location

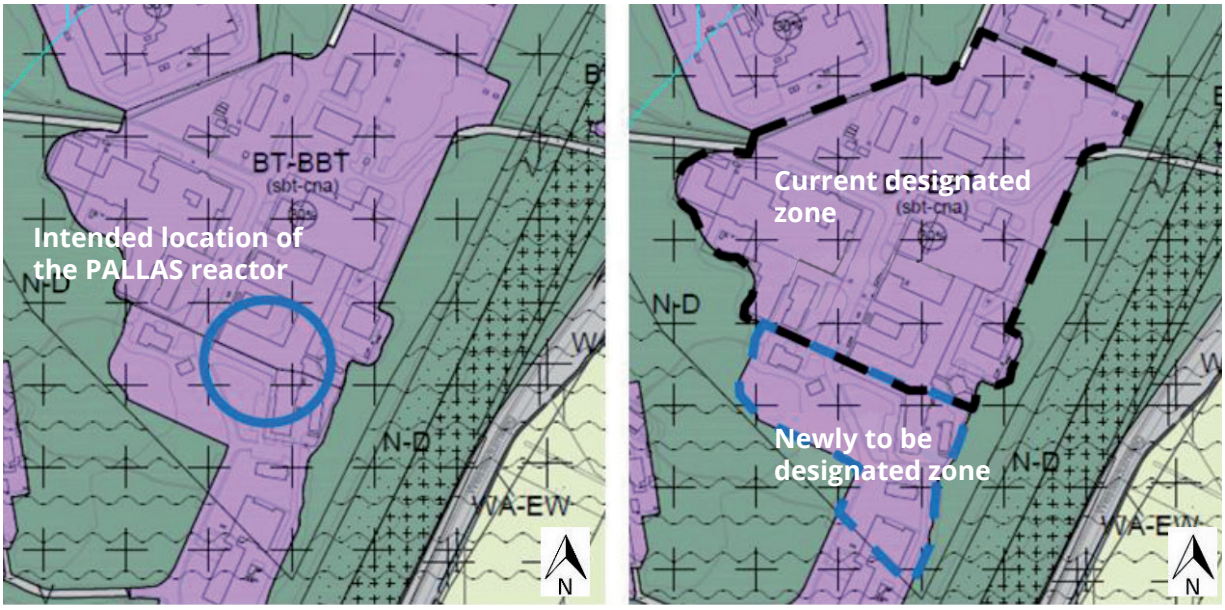
The intended location for the PALLAS reactor is the OLP in the Schagen Municipality. Figure 7 shows the intended location within the OLP. There are no alternatives on or outside of the OLP. This will be explained in more detail in the SEA . The SEA will therefore justify the choice of the intended location (OLP and the location on the OLP).

Intended change to the zoning plan

The current zoning plan (www.ruimtelijke-plannen.nl) has designated part of the OLP for nuclear activities 'concentration area for nuclear activities'. The intended location of the PALLAS reactor on the OLP lies on the boundary of the nuclear/non-nuclear designated area. Figure 7 shows this, with the blue circle symbolising the intended location and the black line in the middle of the circle showing the boundary of the nuclear zone.

To be able to realise the PALLAS reactor, the intended location for the PALLAS reactor and its associated buildings must be designated as being part of the concentration area nuclear activities (designation sbt-cna). The current planned boundary for nuclear activities must

Figure 7



Intended location for PALLAS (blue circle) and intended extended zone of the concentration area for nuclear activities in the zoning plan (blue dotted line) (source: www.ruimtelijkeplannen.nl)

be extended to the south to make the PALLAS reactor possible with respect to the zoning plan. To extend the nuclear activities zone, as much use as possible must be made of the existing lines in the zoning plan. To the east and west of the plane, these are the lines along the nature zone (green) and to the south the line of the dune zone (black wavy lines). ■

2.4 Variants

There are no alternative locations for the PALLAS reactor; this will be explained in more detail in the SEA. The choice for the preferred alternative, the OLP, and the effects of it will be justified in the SEA. The SEA will investigate the variants related to building height and depth of the reactor, and variants for the cooling. The SEA, at the global level, will map out the environmental impact of these variants and will assess the problem areas or points that must be considered from the viewpoint of the environment.

Variant in building height

The Memorandum of Notification of the Decision-EIA has already indicated that various variants have been considered with respect to building height and the related visibility from the local N502 road and from the polder situated to the east of this road. The "Advice relating to the scope and level of detail of the Environmental Impact Report" (www.commissiemer.nl'; 13 August 2015 / Report Number 3042) of the NCEA once more emphasises the importance of the building height/depth. This is in part because the reactor is situated between two lines of dunes and because the below-ground structure can

influence the groundwater table.
Therefore, the SEA will consider three variants for the building height and depth.
These are shown below.

- Variant 1: 17.5 metres above ground level.
- Variant 2: 24 metres above ground level.
- Variant 3: 40 metres above ground level.

Currently, these variants fit to a greater or lesser degree within the zoning plan, namely:

- Variant 1: With respect to building height, fits within the prevailing zoning plan.
- Variant 2: The building height of at the maximum 24 m can be allowed within the area of allowed deviation specified in the current zoning plan.
- Variant 3: The building height requires a change to the zoning plan.

Variants in cooling

Every nuclear reactor must have sufficient cooling. This is required to discharge the generated heat. To achieve this, the PALLAS reactor has a primary and a secondary cooling water system.

The SEA will investigate the following variants for the secondary cooling water system.

- Variant 1: Extract water from the Noord-Hollands canal and discharge it to the North Sea (freshwater-seawater variant).
- Variant 2: Extract water from the North Sea and discharge it to the North Sea (seawater-seawater variant).
- Variant 3: Cooling to air/ hybrid cooling.

The Memorandum of the EIA states that the variant 'Cooling to Air' will not be investigated further in the SER. However, as a result of the opinion of the Hollands Noorderkwartier Water Authority that was received in response to the Memorandum of Notification of the EIA, it has been decided to investigate this variant in the SEA (Variant 3). Variant 3 is expressly not about cooling to the air using high cooling towers. There are low cooling units available on the market that do not have a major visual impact on the landscape. ■

3 Environmental Assessment

3.1 Approach to the Environmental Assessment

The SEA will assess the intended activity and the variants from the various environmental aspects that are listed in Table 2. The content of the SEA will meet the requirements related to content as included in Chapter 7 of the Environmental Management Act (see Requirements for the content of the SEA).

Requirements for the content of the SEA

- Objective of the plan or decision.
- Intended activity & reasonable alternatives.
- Relevant other plans & decisions.
- Current situation & autonomous development.
- Effects for the relevant environmental aspects, including the possible cross-boundary environ mental consequences.
- Comparison of the effects for alternatives.
- Mitigating & compensatory measures.
- Gaps in information and knowledge.
- Summary for a general public.

Plan area and area of study

The plan area is the area for which the zoning plan will be changed. This concerns the area for which the nuclear zone will be extended. This area is shown in Figure 7 in Section 2.3. Because the environmental effects of the intended development extend further than the plan area, the area of study is wider than the plan area. How large this area of study is depends on the effects to be expected and therefore it can differ for each environmental aspect. The SEA will include the justification of the scope of the area of study. ■

3.2 Assessment framework for environmental assessment

The objective of the SEA is to map out the possible environmental effects of the realisation of the intended activity at the OLP, to map out the possible opportunities and problem areas and to formulate the preconditions / recommendations for the further formation of plans within the framework of the permit application.

Reference situation

The environmental assessment will be performed with respect to the reference situation. The reference situation comprises the environmental values present in the current situation and the envisaged autonomous developments that occur in the plan area. Autonomous developments concern other plans and projects that have been identified within the context of the zoning plan.
In accordance with the advice from the NCEA related to the SER, the autonomous development that is assumed is that the HFR will close at a certain moment.

Because it is still uncertain when the HFR will close, the SEA uses two reference situations:

- Reference situation 1: HFR is in operation. For this situation, the environmental effects of the variants in the building phase and in the operational phase will be mapped out. This will ensure that the cumulative effects of the HFR and the PALLAS reactor are clarified.

- Reference situation 2: HFR is not in operation. For this situation, the environmental effects of the variants in the operational phase will be mapped out. This will ensure that the absolute effects of the PALLAS reactor are clarified.

Method of scoring

For each aspect (see Column 2 of Table 2) an assessment table is drawn up that summarises the possible environmental effects. For each assessment criterion, an indication is given of whether a positive effect, a negative effect or no effect can be expected. Table 1 shows this scoring schematically. The reference situation

Table 1

Score	Meaning
++	Probability of a very positive effect
+	Probability of a positive effect
0	No effects to be expected
-	Probability of a negative effect
- -	Probability of a very negative effect

Scores for the environmental assessment

will always be given the neutral score (0).

Type of effects and framework of assessment

Table 2 shows the framework for the environmental assessment. This table shows the themes for which environmental assessments will be made, which environmental aspects will be considered within these themes and which assessment criteria for each environmental aspect will be assessed in the SEA. In addition, for each assessment criterion, how it will be assessed is shown (quantitative or qualitative based on expert assessment).

The SEA will map out both the absolute effects of the PALLAS reactor (Reference situation 2, scenario without HFR) and a comparison of the effects of the intended activity compared to the current situation (Reference situation 1, scenario with HFR). By doing so, the relative change in the environmental situation with respect to the current operation will be made clear (relative effects). The SEA will make a distinction between effects in the construction phase (temporary effects) and effects in the operational phase (permanent effects).

The effects will be investigated in the SEA at the global level, matching the level of detail of the zoning plan and the decision making that is planned within the framework of the zoning plan. This means that the assessments are mainly qualitative, based on expert assessment. Where possible and where it makes sense, a quantitative assessment will be given, where target distances or principle contours are employed that can be used to determine possible problem areas or points to consider from the environmental perspective.

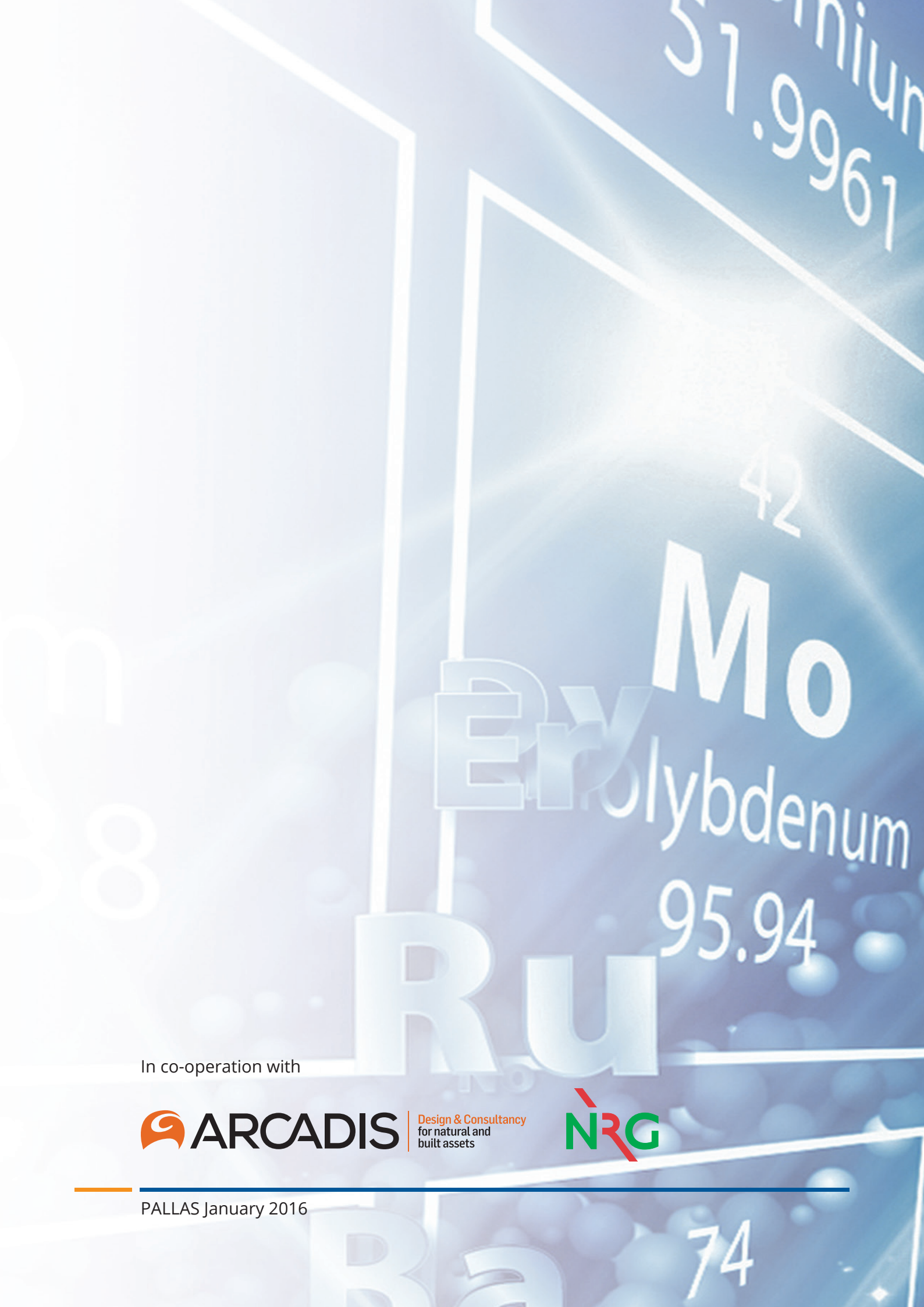
The variants will then be compared in the qualitative sense. The aspect of spatial quality will be mapped out where possible in detail in the SEA because this is an important aspect within the decision-making process for the zoning plan. ■

Table 2

Theme	Aspect	Criterion	Assessment type
Radiation protection and safety:	Radiation protection	• Normal operation – Direct radiation – Radioactive discharge to air – Radioactive discharge to water • Radioactive waste	Quantitative / Qualitative Qualitative
	Safety	• Design-related accidents (single failure and multiple failure) – Dose for local residents • Accidents not related to design – Individual risk – Group risk	Quantitative / Qualitative Quantitative / Qualitative
Soil and water	Soil	• Influencing soil quality • Disturbance of soil structure • Influencing geological monuments	Quantitative / Qualitative Qualitative Qualitative
	Groundwater	• Influencing groundwater quality • Influencing groundwater quantity	Quantitative / Qualitative Quantitative / Qualitative
	Surface water	• Influencing surface water quality • Influencing surface water quantity	Quantitative / Qualitative Quantitative / Qualitative
	Coastal safety	• Influencing dunes	Qualitative
Living environment	Air quality	• Influencing air quality (increased concentration or immission concentration) • Total nitrogen deposition resulting from NOx and NH3 emissions)	Quantitative Quantitative
	Sound	• Sound load on residential buildings, other sound-sensitive buildings and sound-sensitive sites • Sound load on 'sensitive' areas (nature sanctuaries, nature reserves)	Quantitative Quantitative
	Light	• Light emissions	Quantitative
Nature	Protected areas (Natura 2000/ NNN)	• Disturbance • Desiccation • Acidification/ over fertilisation (nitrogen deposition) • Change to dynamics	Quantitative / Qualitative Qualitative Quantitative / Qualitative Qualitative
	Protected and threatened species	• Space occupation • Disturbance • Desiccation	Quantitative / Qualitative Quantitative / Qualitative Qualitative

Spatial quality, landscape and cultural history	Physical form / situation	• Influencing landscape and cultural historical elements and patterns	Quantitative / Qualitative
	Perceived value	• Influencing the visual spatial characteristic of the landscape	Quantitative / Qualitative
	Utility value	• Influencing the use of or suitability for activities in the countryside (recreation & tourism)	Qualitative
Archaeology	Archaeology	• Probability of damaging known archae ological values (AMK sites / observations / reporting findings). • Probability of damaging archeologically expected values	Quantitative / Qualitative Quantitative / Qualitative

Assessment framework SER



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