



The IAEA's Iran NPT Safeguards Report - November 2022

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Background

- Iran has consistently violated its obligations under its comprehensive safeguards agreement (CSA), a key part of the Nuclear Non-Proliferation Treaty (NPT), under which it must cooperate with the International Atomic Energy Agency (IAEA) and fully account for its past and present nuclear activities. The IAEA refers to this process as a country providing both a correct and complete nuclear declaration.
- For four years, the IAEA has been investigating the presence of man-made uranium particles at three Iranian sites. Earlier, it sought information about nuclear material and activities at a fourth site. In March 2022, the IAEA found Iran in breach of its safeguards obligations for failing to declare its use of nuclear material at the fourth site, a former Amad Plan site called Lavisan-Shian.
- The IAEA concluded in September 2022 it is “not in a position to provide assurance that Iran’s nuclear program is exclusively peaceful.” This means the IAEA cannot verify Iran’s compliance with its CSA and the NPT and is implying Iran is violating both agreements.
- This analysis summarizes and assesses information in the IAEA’s latest NPT safeguards report on Iran, issued on November 10, 2022. It also provides extensive background information on the former Iranian nuclear weapons sites under IAEA investigation, in conjunction with the IAEA findings.

Findings

- The Director General states he is “seriously concerned” that there has been no progress in clarifying and resolving the outstanding safeguards issues during this reporting period.
- The IAEA is requesting “technically credible explanations” regarding the presence and origin of uranium particles detected at the three locations, as well as the “current

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location(s) of the nuclear material and/or of the contaminated equipment.” Thus, it is unlikely that the four locations publicly discussed by the IAEA are the only remaining sites in Iran with traces of undeclared uranium.

- Although Iran has engaged with the IAEA during this reporting period, the IAEA reported that no progress was made. The day before the reports were released, IAEA Director General Rafael Grossi told Reuters, “They didn’t bring anything new.”
- Iran agreed to hold a technical meeting with the IAEA “before the end of November” aimed at resolving the outstanding safeguards issues, but it provided no credible indication that it will truly cooperate. In anticipation, the IAEA reiterated to Iran that “at this meeting it expects to start receiving from Iran technically credible explanations on these issues, including access to locations and material, as well as the taking of samples as appropriate.”
- The IAEA provides additional, significant details on two of the three undeclared locations where nuclear material was detected.

Recommendations

- It is critical for the IAEA to continue its investigation of Iran’s violations of nuclear safeguards under the NPT. Due to Iran’s prolonged, ongoing lack of cooperation, the IAEA Board of Governors should pass a resolution condemning Iran’s non-cooperation. It is also overdue to refer the issue to the UN Security Council. However, a referral would not in any way halt the IAEA’s investigations of Iran’s undeclared materials and activities; in fact, it should encourage IAEA members to provide additional information and resources aimed at assisting the IAEA in pressing Iran to come into compliance with its safeguards obligations.
- The United States and Europe should refuse any Iranian demands to end the ongoing IAEA investigation as a condition for a revival of the nuclear deal, or Joint Comprehensive Plan of Action (JCPOA). The West should instead pressure Iran to cooperate with the IAEA by strengthening sanctions, including enacting the so-called snapback of UN sanctions, allowed in case of Iranian non-compliance with the JCPOA.

Latest NPT Safeguards Report

For four years, the IAEA has been investigating the presence of man-made uranium particles at three Iranian sites and sought information about nuclear material and activities at a fourth site. The four sites are Turqz-Abad, Varamin, Marivan, and Lavisian-Shian.² In March 2022, the IAEA found Iran in breach of its safeguards obligations for failing to declare its use of nuclear material at Lavisian-Shian. Out of the four sites of concern, three were discussed in Iran's Nuclear Archive.

It is unlikely that these four locations are the only remaining sites in Iran with traces of undeclared uranium. In reports and press briefings, Director General Grossi has voiced concerns about additional unknown locations from which or to which Iran may have moved nuclear material or contaminated equipment.³ Further, the IAEA may have identified additional sites it seeks to access based on information in the Nuclear Archive. The IAEA has been corroborating information in the Nuclear Archive against Iran's mandatory declaration of nuclear material and activities, in line with the IAEA's mandate to ensure that Iran's declaration is correct and complete. On September 7, the Institute published the location of yet another site identified in the Nuclear Archive, where Iran may have carried out tests using uranium.⁴ The site, called Golab Dareh, is one of four known sites associated with explosive testing of nuclear weapons components and the development of associated, high-speed diagnostic equipment. It appears to be another site that may harbor traces of undeclared uranium, and there are likely others.

On March 5, 2022, the IAEA and Iran agreed in a Joint Statement to a timetable for Iran to provide the agency with information and explanations to clarify the IAEA's discovery of man-made uranium particles at Turqz-Abad, Varamin, and Marivan. During some of these meetings, "Iran provided separate videos and presentations expanding on its explanations" related to the four sites, but the IAEA found the explanations to be not technically credible. By the time of the director general's June report, Iran had failed to provide technically credible explanations and the IAEA reported Iran's failure to comply with the agreed timetable. This led the IAEA's 35-nation Board of Governors to pass a censure resolution against Iran at the June board meeting, with only Russia and China voting against it.

In its latest report, the IAEA reports at three interactions with Iranian officials in Vienna to discuss the outstanding issues. These occurred on September 26, September 27, and November 7, but with no further progress. The director general reports he is "seriously

² The Varamin site is also referred to in Iran's Nuclear Archive as the Tehran Plant.

³ For example, Grossi wrote in a May 2022 safeguards report: "[Some of the] isotopically altered particles [found at Turqz-Abad] must have come from another unknown location." See: IAEA Director General, "NPT Safeguards Agreement with the Islamic Republic of Iran," GOV/2022/26, May 30, 2022, <https://isis-online.org/uploads/iaea-reports/documents/gov2022-26.pdf>.

⁴ David Albright and Sarah Burkhard, "The Fourth Nuclear-Weapons-Related Testing Site Located: Another Parchin Site, More Undeclared Nuclear Material Possible," *Institute for Science and International Security*, September 7, 2022, <https://isis-online.org/isis-reports/detail/the-fourth-nuclear-weapons-related-testing-site-located/>.

concerned that there has still been no progress in clarifying and resolving the outstanding safeguards issues during this reporting period.”

The IAEA reports that it will conduct a technical visit to Tehran “before the end of November 2022,” where it “expects to start receiving from Iran technically credible explanations on these issues, including access to locations and material, as well as the taking of samples as appropriate.” The director general “stresses that this meeting should be aimed at effectively clarifying and resolving” the outstanding safeguards issues.

The IAEA, in essence, reports that Iran is in breach of its safeguards obligations and will remain so until it cooperates. The IAEA “reiterates that unless and until Iran provides technically credible explanations for the presence of uranium particles of anthropogenic origin at three undeclared locations in Iran and informs the Agency of the current location(s) of the nuclear material and/or of the contaminated equipment, the Agency will not be able to confirm the correctness and completeness of Iran’s declarations under its Comprehensive Safeguards Agreement. Therefore, the Agency is not in a position to provide assurance that Iran’s nuclear programme is exclusively peaceful.”

To maintain and bolster the IAEA’s credibility, the IAEA Board of Governors needs to pass a new censure resolution demanding Iran’s compliance with its NPT obligations. It is overdue to refer the case to the UN Security Council as a response to Iran’s intransigence.

A referral to the UN Security Council need not in any way end the IAEA’s effort to obtain answers from Iran; in fact, it should enhance the IAEA’s quest for answers, as was the case in 2005 when the Board of Governors first referred Iran’s non-compliance to the UN Security Council. As specified in the resolution adopted on September 25, 2005, the board requested the IAEA to step up its efforts to bring Iran into compliance with its safeguards obligations and “pursue additional transparency measures” to “reconstruct the history and nature of all aspects of Iran’s past nuclear activities and to compensate for the confidence deficit created.”⁵ The years following that referral were marked by increased IAEA efforts to address its concerns about Iran’s nuclear weapons efforts, backed by increased resources from IAEA members, particularly in terms of new, actionable information. That referral and sequencing should be repeated today.

The United States and its European counterparts, Britain, France, and Germany (the E3), should reject Iran’s attempt to link closure of the IAEA’s investigation with renegotiation or re-implementation of the 2015 nuclear deal, known as the JCPOA. Iran has demanded the parties ensure the probe’s closure prior to a new deal’s implementation. In addition, if the parties lift sanctions on Iran in the lead-up to a new deal’s re-implementation day, it is unlikely Iran will cooperate with the IAEA. Linking the JCPOA and IAEA probe could also force a showdown with

⁵ IAEA Board of Governors, *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran*, Resolution adopted on 24 September 2005, GOV/2005/77, September 24, 2005, <https://www.iaea.org/sites/default/files/gov2005-77.pdf>.

Iran at the IAEA that may end with the United States and E3 voting at the board to preemptively close the IAEA investigation in order to re-implement the deal, much as they did to implement the JCPOA in 2015. Director General Grossi has stood firm, however, saying there can be no political solution to his investigation.

Member states have a responsibility to uphold the NPT and send a signal to Iran, as well as other would-be proliferant states, that they will not tolerate NPT violations. Their failure to act decisively will undermine the IAEA's authority, lead to the NPT's degradation, and other states seeking nuclear weapons.

Four Locations With Undeclared Nuclear Activities⁶

Location 1: Turqz-Abad Warehouse

The open-air warehouse in Tehran's Turqz-Abad district held cargo containers and other items that contained nuclear-related equipment and material (see Figure 1).⁷ In 2018, the IAEA observed activities consistent with sanitization of the site. Commercial satellite imagery confirms this activity and documents Iran's earlier, speedy removal of all shipping containers and scraping of the grounds.⁸ The IAEA requested access to the site and took environmental samples in February 2019, detecting processed natural uranium particles, potentially produced through undeclared uranium conversion activities. Through additional analysis, traces of isotopically altered uranium particles were detected as well, including "low enriched uranium with a detectable presence of U-236, and of slightly depleted uranium."

The IAEA concluded the "containers that had been stored at this location had contained nuclear material and/or equipment that had been heavily contaminated by nuclear material, or both." The Agency also assesses[d] that while some of the containers at Turqz-Abad were dismantled, others were removed from the location intact in 2018 and moved to an unknown location." This finding is confirmed by available commercial satellite imagery.

Some containers present at Turqz-Abad had come from the Varamin site, aka the Tehran Plant, which is another former site associated with Iran's pre-2004 crash nuclear weapons program known as the Amad Plan⁹ (see below). However, the nuclear activities carried out at Varamin do not explain the presence of the multiple types of isotopically altered particles found

⁶ For fuller descriptions of these four locations and their relationship to today, see David Albright with Sarah Burkhard and the Good ISIS Team, *Iran's Perilous Pursuit of Nuclear Weapons* (Washington, D.C.: Institute for Science and International Security Press, 2021).

⁷ John Irish and Arshad Mohammed, "Netanyahu, in U.N. Speech, Claims Secret Iranian Nuclear Site," *Reuters*, September 27, 2018, <https://www.reuters.com/article/us-un-assembly-israel-iran/netanyahu-in-un-speech-claims-secret-iranian-nuclear-site-idUSKCN1M72FZ>.

⁸ David Albright, Sarah Burkhard, Olli Heinonen, and Frank Pabian, "Presence of Undeclared Natural Uranium at the Turqz-Abad Nuclear Weaponization Storage Location," *Institute for Science and International Security*, November 20, 2019, <https://isis-online.org/isis-reports/detail/presence-of-undeclared-natural-uranium-at-the-turqz-abad-nuclear-weaponiza>.

⁹ *Iran's Perilous Pursuit of Nuclear Weapons*.

at Turquz-Abad. The IAEA concluded that those isotopically altered particles must have come from yet another, unknown location or other locations.

During the process outlined in the Joint Statement of March 5, 2022, “the only additional explanation offered by Iran for the environmental sample results at Turquz-Abad was the possibility of an act of sabotage by a third party to contaminate the area.” However, Iran provided no evidence to support this explanation. It also stated that it was unable to identify the current location of the containers or their contents following their removal from Turquz-Abad in 2018.

Iran has failed to provide technically credible explanations to the agency to account for the uranium particles. The IAEA concluded in June 2022, “On the basis of the process conducted and the exchanges of information with Iran as described in the Joint Statement of 5 March 2022, the presence of anthropogenic uranium particles at Turquz-Abad is not clarified.” In its latest report, the IAEA reports there has been no additional clarification from Iran.

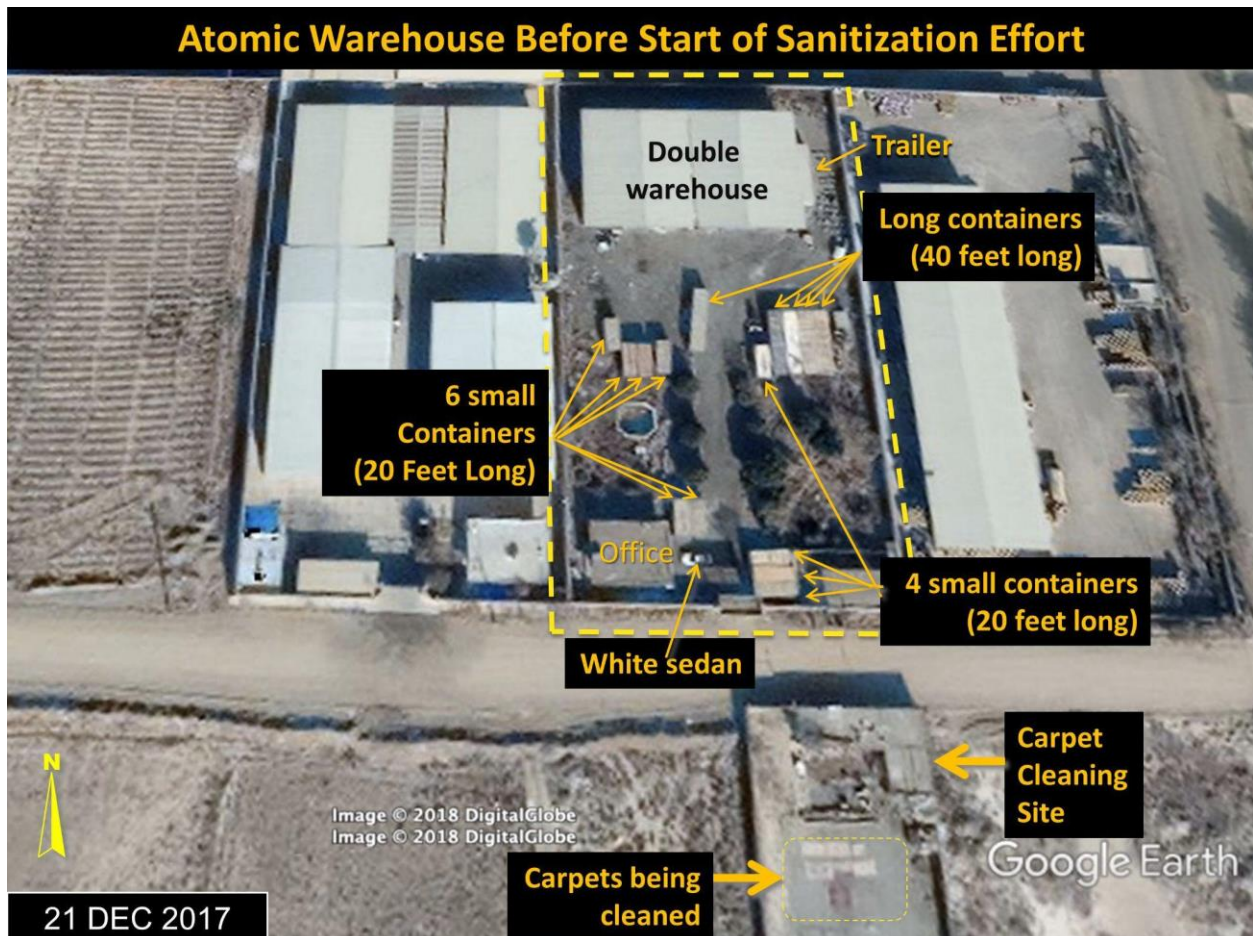


Figure 1. Turquz-Abad, also known as the “Atomic Warehouse, secretly stored shipping containers and other items associated with the Amad Plan and possibly other undeclared nuclear activities, later emptied by Iran.

Location 2: Lavisian-Shian

The IAEA previously reported that the use and processing of uranium metal and related activities at Lavisian-Shian were undeclared and constituted violations of Iran’s safeguards agreement. It reported, “activities and the nuclear material used therein at Lavisian-Shian were not declared by Iran to the Agency as required under the Safeguards Agreement.” Specifically, the IAEA assesses that “in 2003 at Lavisian-Shian, at least one natural uranium metal disc, out of ten such discs available (totaling approximately 10 kg), underwent drilling to produce metallic flakes. These flakes were subsequently subjected to chemical processing on at least two occasions at the same location.”

While the IAEA has been unable to find the uranium metal and has apparently stopped looking – at least for the time being — the safeguards violation seems certain. The IAEA added that it has “no additional questions on the issue related to Lavisian-Shian and, therefore, [this] issue [is] no longer outstanding.”

This statement should not be seen as the IAEA giving Iran a pass on activities at Lavisian-Shian, but more as an indication of the agency giving up on trying to determine the fate of the discs in question, likely a result of on-going Iranian non-cooperation. The operative conclusion is that Iran’s use and processing of this disc violated its safeguards obligation under the comprehensive safeguards agreement.

What was Lavisian-Shian? Lavisian-Shian was a former headquarters of Iran’s nuclear weapons program and a key site during the Amad Plan.¹⁰ Iran razed the site in 2003 and 2004 as the IAEA’s investigation into its covert nuclear program intensified (see Figure 2).¹¹

¹⁰ *Iran’s Perilous Pursuit of Nuclear Weapons*.

¹¹ David Albright, Paul Brannan, and Andrea Stricker, “The Physics Research Center and Iran’s Parallel Military Nuclear Program,” *Institute for Science and International Security*, February 23, 2012, https://isis-online.org/uploads/isis-reports/documents/PHRC_report_23February2012.pdf. See also: *Iran’s Perilous Pursuit of Nuclear Weapons*.

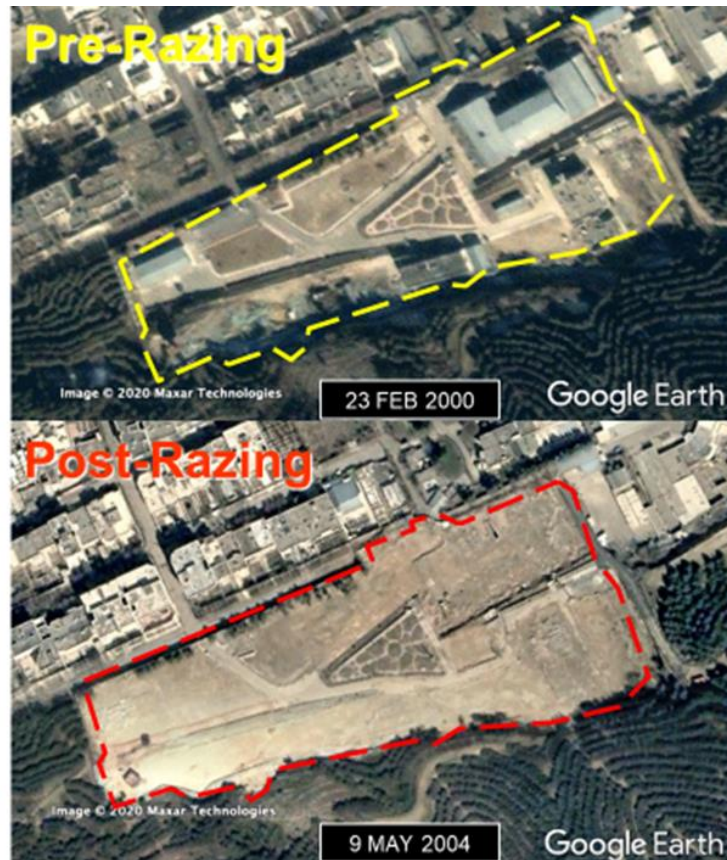


Figure 2. Before and after pictures from 2000 (above) and 2004 (below) show the extent of razing and sanitization that took place at Lavisian-Shian.

The metal disc at Lavisian was apparently part of Iran’s nuclear weapons-related work, detailed in Iran’s Nuclear Archive. Among the files was information about Iran’s work on producing uranium deuteride (UD₃) for a neutron initiator used in nuclear weapons. The information detailed procedures Tehran used to make uranium deuteride, with an initial step involving drilling into a piece of uranium metal to obtain small pieces or flakes.¹²

The IAEA’s assessment of the metal flakes undergoing chemical processing stops short of specifying the achieved or intended chemical product but is consistent with the production of uranium deuteride. Further, the IAEA stated in its June 5, 2020 report that the uranium metal disc had “indications of it undergoing drilling and hydriding.”¹³ The statement about “drilling and hydriding” more directly refers to the production of uranium deuteride.¹⁴

¹² “Neutron Source: Iran’s Uranium Deuteride Neutron Initiator,” *Institute for Science and International Security*, May 13, 2019, <https://isis-online.org/isis-reports/detail/neutron-source-irans-uranium-deuteride-neutron-initiator-1/>. See also, *Iran’s Perilous Pursuit of Nuclear Weapons*.

¹³ IAEA Director General, “Verification and Monitoring in the Islamic Republic of Iran in Light of United Nations Security Council resolution 2231 (2015),” GOV/2020/26, June 5, 2020, https://isis-online.org/uploads/iaea-reports/documents/IAEA_Iran_Quarterly_Safeguards_Report_June_2020_.pdf

¹⁴ “Neutron Source: Iran’s Uranium Deuteride Neutron Initiator.”

The production of UD_3 typically involves producing uranium metal chips or shavings from a solid uranium metal piece and combining them under controlled temperatures and pressures with deuterium gas. Iran's Nuclear Archive contains an image of equipment in a glove box producing the uranium metal flakes (see Figure 3); other documents in the archive describe a step-by-step effort to produce UD_3 , including practicing its synthesis with surrogate materials. The testing of a UD_3 neutron initiator is also extensively discussed in the Nuclear Archive, incidentally, helping explain the IAEA's detection in 2015 of uranium from environmental sampling done at the Parchin high explosive chamber, despite Iran's extensive sanitization efforts.¹⁵

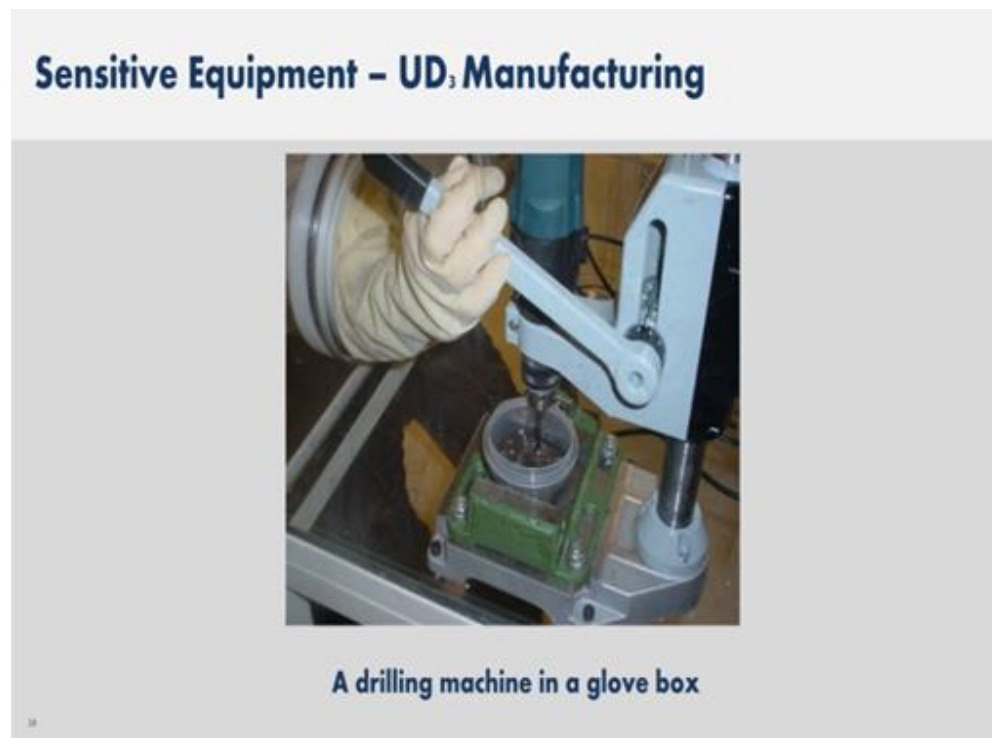


Figure 3. A photo from Iran's Nuclear Archive, obtained by the media and shared with the Institute, shows a glove box containing a drilling machine, with what appears to be a black object that is likely the uranium metal disc at issue at Lavisian-Shian.

Under the Amad Plan, the production of uranium deuteride had a codename, Project 3.20. When the Amad Plan was downsized and reconstituted as a smaller, more disguised effort in late 2003 and early 2004, Project 3.20 was to be closed, but a few of the project staff needed to make the "Source" – a codeword for the uranium deuteride neutron initiator – were slated to continue their activities.¹⁶

¹⁵ David Albright, Sarah Burkhard, Olli Heinonen, and Frank Pabian, "New Information about the Parchin Site: What the Atomic Archive Reveals About Iran's Past Nuclear Weapons Related High Explosive Work at the Parchin High Explosive Test Site," *Institute for Science and International Security*, October 23, 2018, <http://isis-online.org/isis-reports/detail/new-information-about-the-parchin-site>.

¹⁶ Memorandum, Statement of Mohsen Fakhri-zadeh, October 25, 2003. From Nuclear Archive. See: *Iran's Perilous Pursuit of Nuclear Weapons*.

Evidence of post-2003 Iranian work on UD₃ and neutron initiators includes an Iranian document that surfaced in 2009. The document, dated to 2007, discusses how, although work on neutron sources made progress in the past, it was reduced in scale, leading to a decision to increase that work starting in about 2007, including continuing ongoing work on the production and testing of a UD₃ initiator.¹⁷

The IAEA should further explain the safeguards violations at Lavisan, and what it means for the IAEA's ability to determine the nature of Iran's nuclear program. Additional follow-up questions include: what happened to the equipment used for making and chemically processing uranium metal flakes? What is the status and purpose of neutron initiator activities conducted after 2003? Like containers from Varamin, other containers at Turquz-Abad may have held equipment and materials from Lavisan-Shian.

Location 3: Tehran Plant, near Varamin

The agency reports new information regarding the Varamin site while noting Iran's refusal to address safeguards violations at the site.

Varamin is identified in Iran's Nuclear Archive as the "Tehran Plant," or what the IAEA calls the Varamin site, after a nearby town. The site, visible in Figure 4, was a secret pilot and laboratory-scale uranium conversion plant under the Amad Plan.¹⁸ The November 2022 IAEA report adds more detail about the conversion facility; it provides an IAEA assessment that the site, used between 1999 and 2003, was an undeclared pilot plant for the processing and milling of uranium ore and conversion into uranium oxide, as well as for laboratory-scale conversion into uranium tetrafluoride and uranium hexafluoride.

Iran demolished the site in 2004. According to earlier IAEA reports, this location "underwent significant changes after 2003, including the demolition of most buildings, scraping and landscaping that was consistent with sanitisation, as well as the removal of containers." This can also be seen in commercial satellite imagery published by the Institute.

The IAEA originally asked for access to the site in January 2020, but Iran refused until August 2020. The IAEA took environmental samples whose analysis indicated the presence of undeclared man-made uranium particles.

¹⁷ "New Document Reopens Question on Whether Iran's Nuclear Weaponization Work Continued Past 2003," *Institute for Science and International Security*, December 14, 2009, <https://isis-online.org/isis-reports/detail/new-document-reopens-question-on-whether-irans-nuclear-weaponization-work-c/8>; Farsi and English versions of the document are available at: <http://isis-online.org/isis-reports/detail/farsi-and-english-versions-of-document-on-neutron-initiator/>.

¹⁸ *Iran's Perilous Pursuit of Nuclear Weapons*, Chapters 8 and 12; and David Albright, Sarah Burkhard, and Frank Pabian, "The Amad Plan Pilot Uranium Conversion Site, Which Iran Denies Ever Existed," *Institute for Science and International Security*, November 9, 2020, <https://isis-online.org/isis-reports/detail/the-amad-plan-pilot-uranium-conversion-site/8>.

Earlier IAEA reports link materials at this site to Turqz-Abad. The IAEA reported in its September 2021 report that Iran removed containers from the site in 2004 and that “there are indications, supported by the results of the environmental samples analysis, that containers moved from Location 3 [Varamin] were subsequently also present at Location 1 [Turqz-Abad].” The November 2022 report states that the containers were “eventually transferred to Turqz-Abad.” However, the IAEA further reports that the uranium conversion activities carried out at Varamin “do not explain the presence of the multiple types of isotopically altered particles” found at Turqz-Abad. This finding is in line with assessments that Turqz-Abad was a storage location for a wide variety of equipment related to Iran’s undeclared nuclear activities. Iran’s subsequent explanations were judged as lacking support or inconsistent with the evidence. In its latest report, the IAEA reports no additional clarification from Iran.

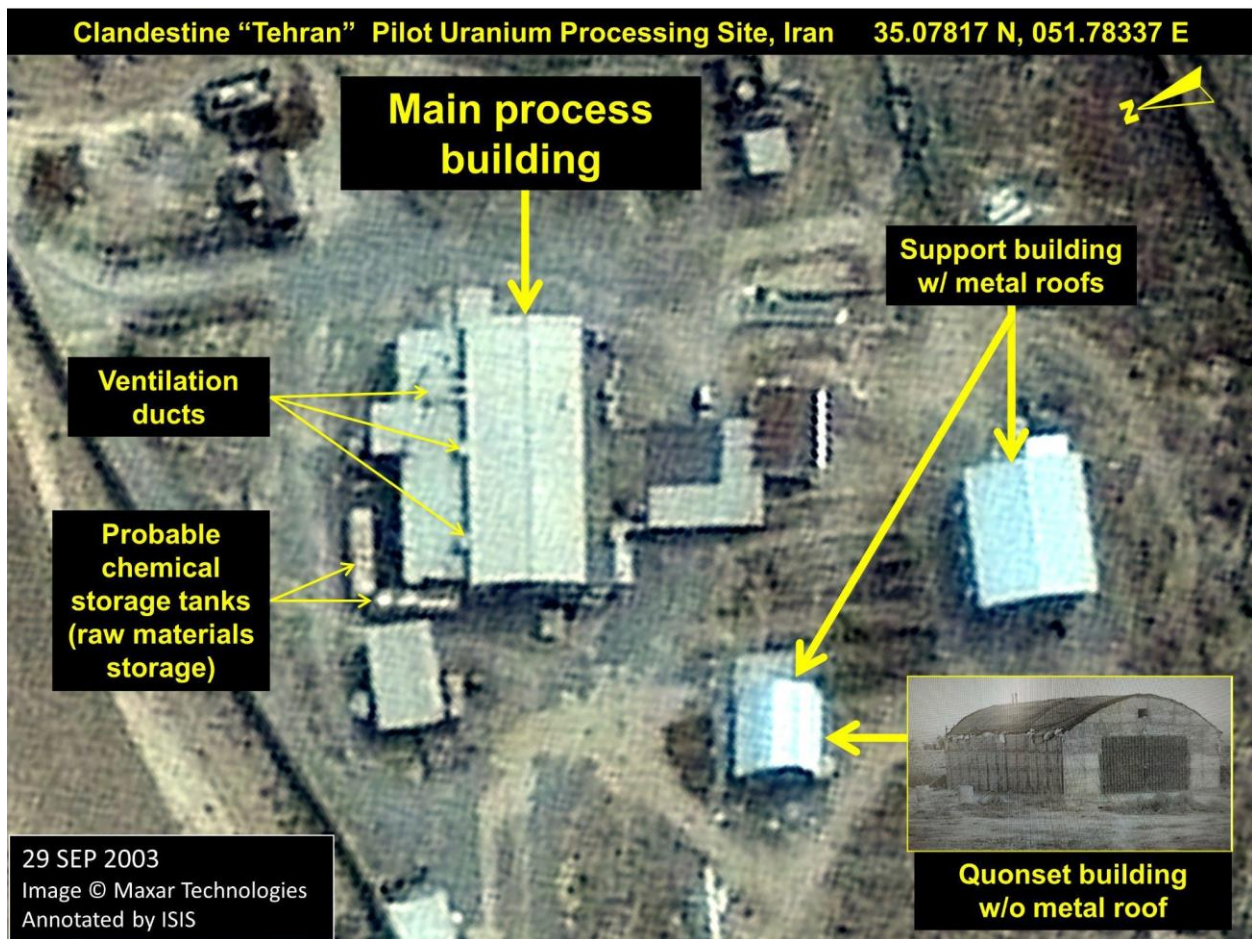


Figure 4. The undeclared Varamin uranium conversion facility was used between 1999 and 2003 as part of the Amad Plan.

Location 4: Marivan Site

The IAEA was also unsuccessful in resolving safeguards issues at Marivan. The formerly secret Marivan site, near Abadeh, is another Amad Plan facility identified in the Nuclear Archive.¹⁹ The IAEA noted in previous reports that Marivan “consists of two proximate areas where the Agency found indications that Iran had, in 2003, planned to use and store nuclear material.” Figure 5 shows these two likely areas at Marivan; one, an outdoor area for high explosive testing, and the second, a development site with several buildings about 1.5 kilometers away from the outdoor testing site.

Along with the Varamin site, the IAEA sought access to Marivan in January 2020, which Iran refused until August 2020, when the IAEA took environmental samples that revealed the presence of uranium particles.

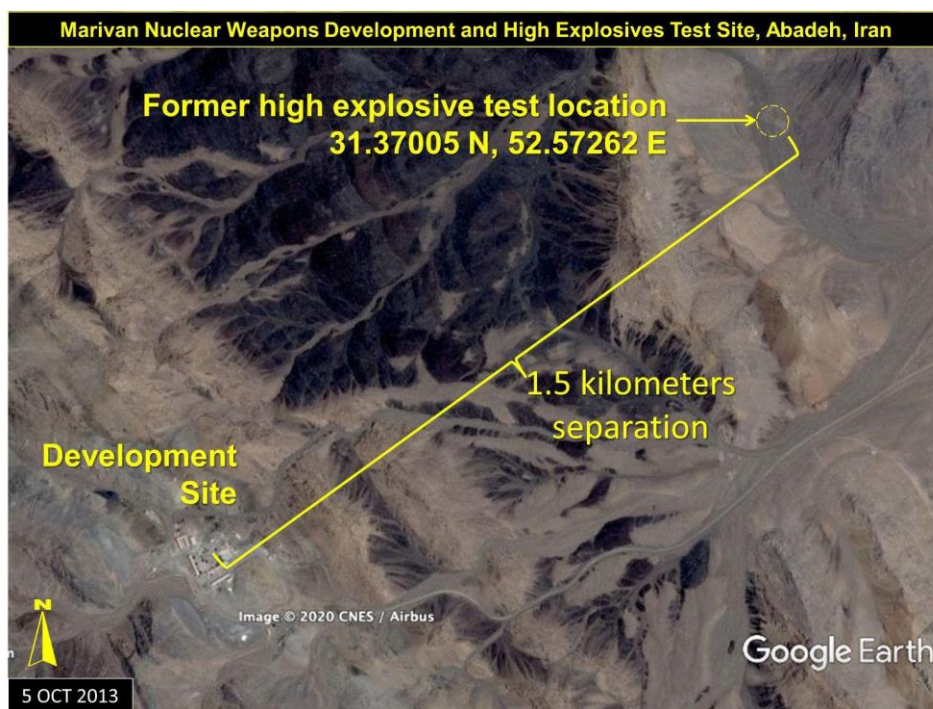


Figure 5. The Marivan high explosive test site and its relative location to the development site, also called the logistical support site.

In one area (see Figures 6 and 7), according to earlier IAEA reports, “where outdoor, conventional explosive testing may have taken place,” the IAEA found “indications relating to the testing of shielding in preparation for the use of neutron detectors in that same area” (see Figure 8). In the November 2022 report, the IAEA is more definitive, stating: “The analysis of all safeguards-relevant information available to the Agency related to ‘Marivan’ is consistent with

¹⁹ David Albright, Sarah Burkhard, and Frank Pabian, “Abadeh is Marivan: A Key, Former Secret Nuclear Weapons Development Test Site,” *Institute for Science and International Security*, November 18, 2020, <https://isis-online.org/isis-reports/detail/abadeh-is-marivan-irans-former-secret-nuclear-weapons-development-test-site>.

Iran having conducted explosive testing with protective shielding in preparation for the use of neutron detectors.”

The November 2022 report indicates that the IAEA’s environmental sampling revealed the presence of anthropogenic uranium particles not at this outdoor testing site, but at “another area” of Marivan, likely the development area. The IAEA states in its November 2022 report that it “found indications that Iran had in 2003 planned to use and store nuclear material at ‘Marivan’ for explosive testing.” This would suggest that the uranium was being stored there for future use in explosive testing at the nearby outdoor test area.

Earlier, the IAEA reported that from July 2019 onwards, it “observed via commercial satellite imagery, activities consistent with efforts to sanitize the area, including the demolition of buildings.” Figure 9 shows the razed development site as of July 2020.

The IAEA attempted to engage Iran regarding Marivan in September 2021, providing Iran with “graphics based on commercially available satellite imagery that illustrated the activities identified by the Agency as inconsistent with Iran’s statement that there had been no activity at this location between 1994 and 2018.” In a reply, Iran stated, “‘only the mining activities, which were main activities at this location, have been stopped during the said period’ and that the activities observed at the location had involved guards ‘to secure the properties at location.’”

According to the September 2021 IAEA report, the IAEA stated it would contact another member state to seek “clarification and confirmation” in response to information provided by Iran that “included a reference to activities conducted at Location 4 in the past by an organization from another Member State.” The member state responded that “the information provided by Iran had contained ‘no information indicating a link’ between the cooperation provided by the aforementioned organization in Iran, mentioned in the supporting documentation provided by Iran, ‘and the anthropogenic uranium particles found by the Agency.’”

An Institute assessment of satellite imagery of the site found that Iran appears to have conducted further demolition activities following the IAEA’s visit, possibly to stymie future verification activities (see Figure 10).²⁰ In its previous report, the IAEA stated that following its access to the site, it “observed through the analysis of commercially available satellite imagery that the aforementioned bunkers had been removed.”

The IAEA reported in its September 2021 report that in addition to explaining the presence of uranium, Iran must also provide answers regarding “the source of the neutrons that the

²⁰ David Albright and Sarah Burkhard, “More Demolition at the Marivan Former Nuclear Weapons Development Site,” *Institute for Science and International Security*, March 1, 2022, <https://isis-online.org/isis-reports/detail/more-demolition-at-the-marivan-former-nuclear-weapons-development-site>.

neutron detectors were to measure” at the location. Iran has only provided unsubstantiated information about activities at Marivan, which the IAEA has dismissed.

The source of the neutrons was likely a uranium deuteride neutron initiator that would have been placed at the center of a nuclear weapons high explosive system lacking its fissile material. When the system is detonated, the inward compression from the high explosive would squeeze the surrogate core with the neutron initiator at its center, creating fusion of the deuterium, resulting in a spurt of neutrons. If the core had contained fissile material, or weapons-grade uranium in the Iranian design, the neutrons would have started the chain reaction and the nuclear explosion. This type of test, often called a “cold test,” is done near the end of a nuclear weapons development program and is often the last test before starting the manufacture of nuclear weapons. According to information in the Nuclear Archive, Iran was approaching the point at which it would conduct a cold test, but had not done so by the time the Amad Plan was halted in 2003. It is unknown if Iran conducted such a test elsewhere after 2003.

Despite the evidence, Iran stated in May 2022 that the photographs previously provided by the IAEA of the bunkers at Marivan were “fabricated.” According to the IAEA, “This is despite the photographs being consistent with the Agency’s observations through the analysis of commercially available satellite imagery and visual observations during the complementary access at this location.”

The IAEA further drew a connection between Marivan and Turqez-Abad, noting that based on analysis of commercially available satellite imagery, “trucks observed at Marivan and Turqez-Abad between mid-July and mid-August 2018 had similar features,” and that major parts of the Marivan site were demolished right after the IAEA shared its sampling results from Turqez-Abad.

In its latest report, the IAEA indicates there has been no additional clarification from Iran regarding the activities.

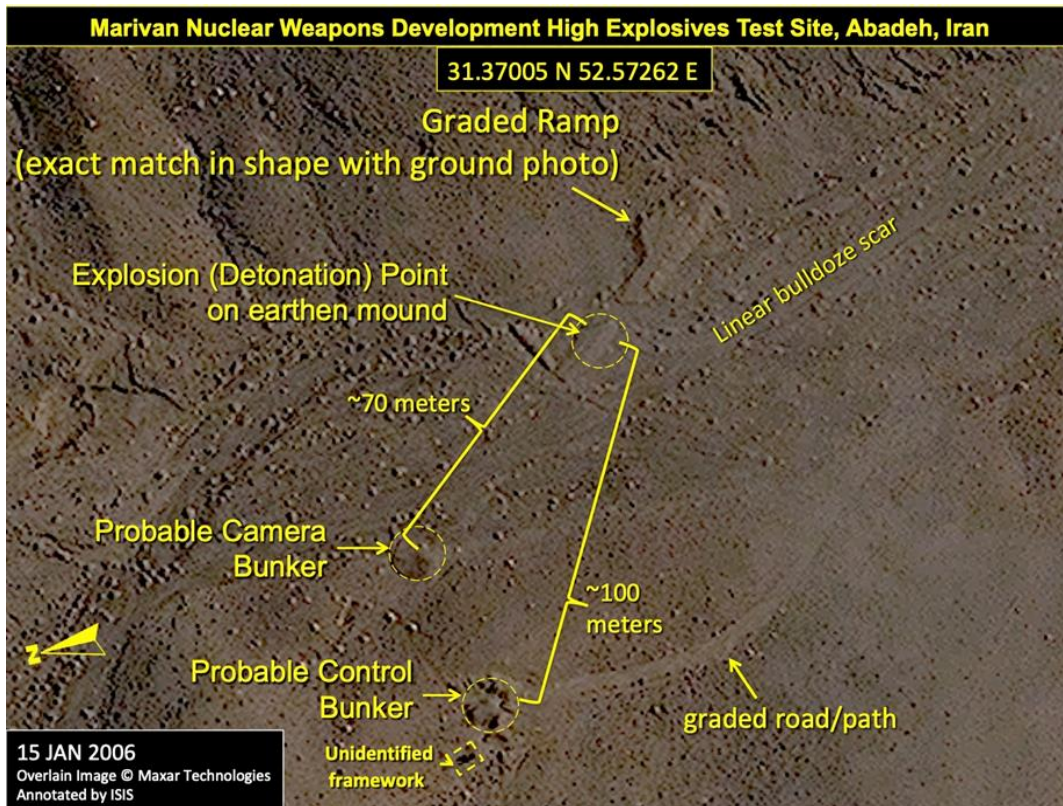


Figure 6. The Marivan high explosives test site near Abadeh, Iran, as it appeared in 2006, showing the location of the two bunkers and an explosion point that was slated to use the neutron detectors.

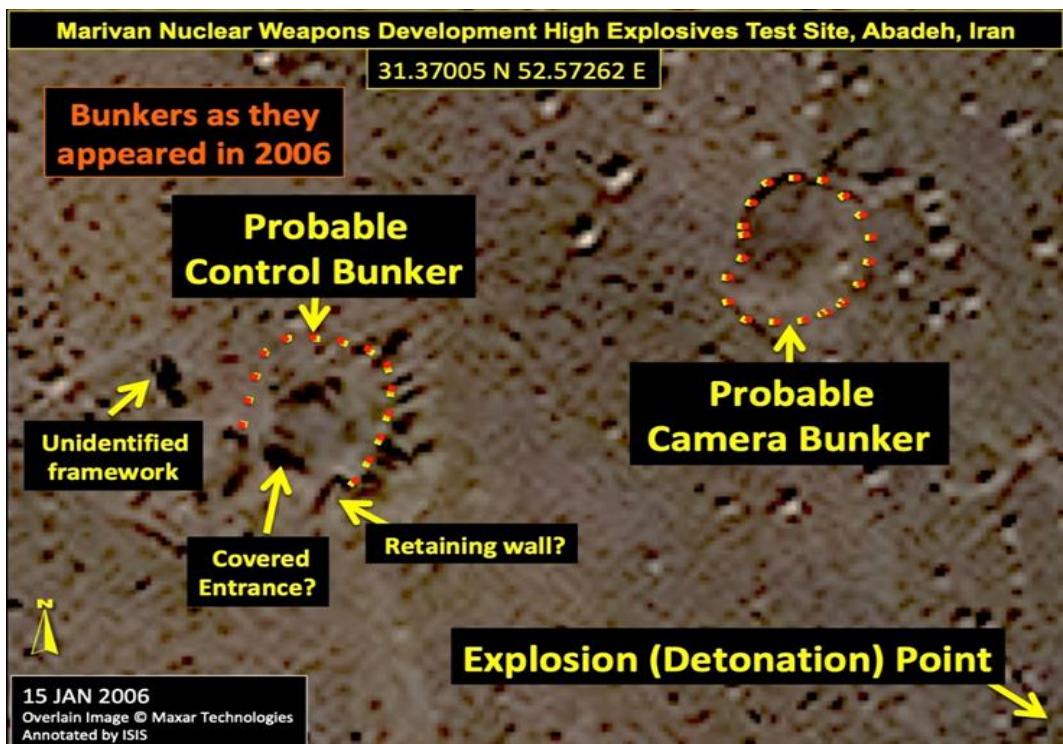


Figure 7. A close-up of the explosive test site's associated bunkers as they appeared in 2006, the nearest-in-time available high-resolution image to the 2003 tests.

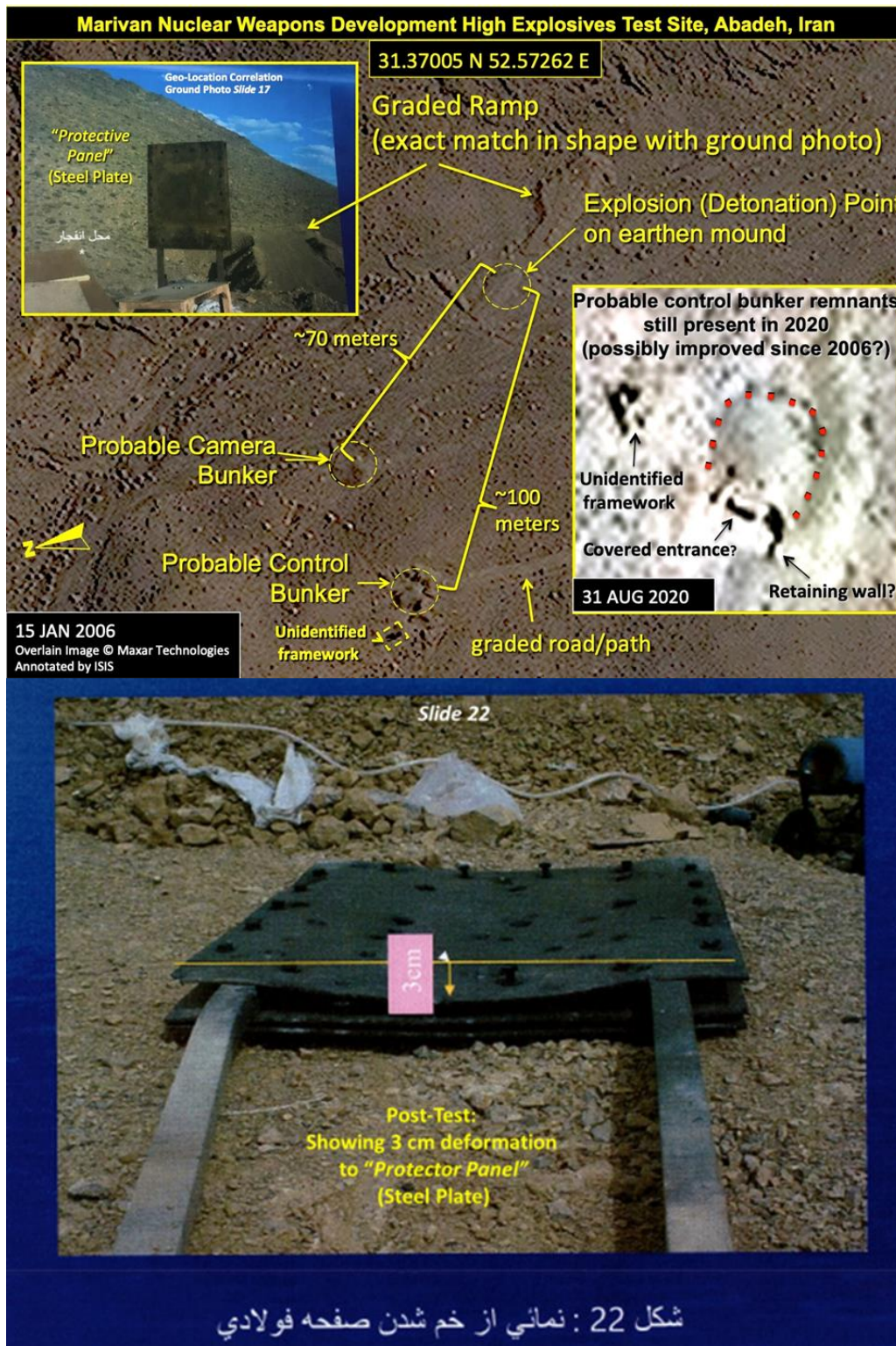


Figure 8. Top image: A 2006 image of the test site at Marivan, with a ground photo inset from the Nuclear Archive, showing shielding material, pre-test. Bottom image: Shielding material post-test.

Abadeh Nuclear Weapons Development Site ***31.36163N 52.56055E***



Figure 9. During a press conference, then-Prime Minister Benjamin Netanyahu used these before (left) and after (right) images of Marivan, also known after the nearby town of Abadeh, to show the site's abrupt razing in July 2019.

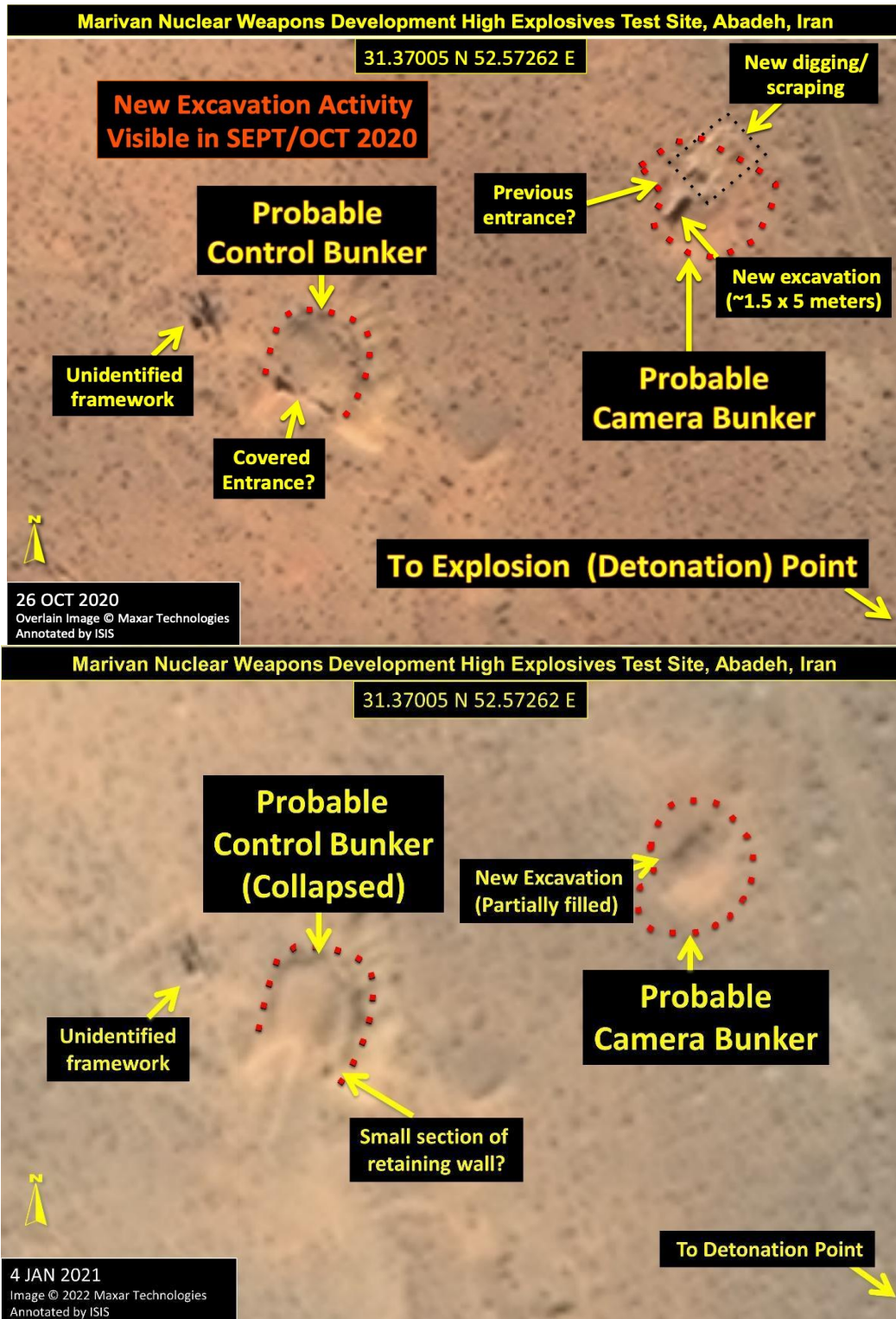


Figure 10. In top image, detected excavation and digging/scraping activity at the probable camera bunker, post-August 31, 2020. In bottom image, the excavation appears partially filled and the probable control bunker appears collapsed as of January 2021.