NHS REQUIREMENT

The structure of this NHS Requirement is as follows:

1 Introduction

Scotland has a population of 5.4 million who are served by five Cancer Centres, which amongst them currently use 28 radiotherapy machines or linear accelerators (Linacs) to deliver in excess of 200,000 fractions of treatments per annum. Each Cancer Centre has at least one Treatment Planning System (TPS), which is used to model patient treatments.

In this financial year, NHS Lothian's Treatment Planning System (TPS) will be replaced under the Scottish Government's Radiotherapy Capital Equipment Replacement Programme (CERP) in order to provide efficient and effective delivery of radiotherapy services throughout Scotland.

National Services Scotland (NSS) acting through its division Health Facilities Scotland (HFS) is undertaking this procurement on behalf of NHS Lothian.

The (TPS) must remain up to date to enable modelling of the increasingly complex and rapidly developing radiotherapy techniques required to deliver optimal treatment for patients. Intensity Modulated RadioTherapy (IMRT), and in particular Volumetric Modulated Arc Therapy (VMAT), is considered the standard of care for most patients with head & neck and prostate cancers and there is an increasing body of evidence of benefit for patients with other tumours such as gynaecological cancers, oesophageal, anal and lung cancer. It is estimated by the Radiotherapy Board that approximately 50% of radical patients would benefit from IMRT. It is thus a requirement that equipment supplied is compatible with NHS Scotland's intention to make available either, or both, IMRT and VMAT to all patients who might benefit.

Image Guided RadioTherapy (IGRT) is a technological development which enables the accuracy of patient positioning on the treatment couch to be confirmed thereby increasing the chances of cure and reducing dosage to normal tissues. It is a requirement that all equipment tendered be compatible with NHS Scotland's intention to make image guidance, including tracking tumour motion available to all patients who might benefit.

It is sought through this tender to help increase the number of patients receiving IMRT and IGRT as this remains an important clinical focus. One of the requirements of this tender is therefore to implement new and improved systems that will reduce the time required for planning and voluming to maximise efficient working practices.

The Edinburgh Cancer Centre (ECC) is the NSS-designated national centre for stereotactic radiosurgery (SRS) for benign conditions, contracted to treat 80 patients with 1-6 fractions of radiotherapy for vestibular schwannoma, meningioma and arteriovenous malformations. In addition to this, we provide a regional service for SE Scotland treating larger meningiomas and pituitary adenomas with conventionally fractionated stereotactic therapy and malignant lesions, principally brain metastases. In total we treat in excess of 130 patients per annum with SRS.

To maximise efficiency, we wish to continue with a frameless SRS system with 6D on-board localisation. In order to treat the full spectrum of conditions we require image fusion of all modalities including angiograms.

The Oncology Management System (OMS) must remain up-to-date. There are different options available now, like virtualisation, improvements in the ability to work remotely and much reduced paper

requirements. The DICOM Archive (DA) will similarly require updating. There may be some overlap in the purchasing of these items and vendors should make any overlap clear in their offer.

The TPS, OMS and DA were last updated in 2016 so will be 5 years old by the time they are replaced. There have been a lot of technological improvements in that time. Also, hardware is generally regarded as having a lifetime of 3 to 5 years.

Reducing the time from referral to commencing cancer treatment is one of the prime targets of the Scottish Government. Therefore, although the Health Board requires equipment which satisfies the demand for IMRT, VMAT and IGRT described above, it is also important that the compatibility of all new equipment with the Cancer Centre's existing equipment can be demonstrated.

Due to high demand for radiotherapy and requirement for uninterrupted continuity of service, it is essential that all services, training and support for clinical implementation in the ECC are described, to aid us in assessing and scoring the impact of change to the department.

Contractors' ability to meet the requirements on IMRT, VMAT, IGRT and compatibility set out in this NHS Requirement will be scored by assessment of their response to the Technical Specifications of this NHS Requirement, the implementation requirements and by the demonstration and use of the software. To this end, it is a requirement that a system can be loaned to NHS Lothian for a period of no less than two weeks to trial if it is considered necessary.

It is expected that all Contractors will require to undertake site visits to NHS Lothian in order to understand interfacing requirements and inform Contractors' responses to this NHS Requirement.

The functional and technical requirements are classified as follows: -

(a) mandatory requirements (M) – these are requirements which are mandatory and must be met;

(b) requirements identified as (E) – these are requirements the response to which will be scored;

(c) requirements identified as (I) – these are requirements the response to which will not be scored, but a comprehensive response to such requirements is required. The response should clearly narrate any qualifications regarding performance.

Contractors should note that all NHS Requirements and all responses (regardless of whether these are (M), (E) or (I) requirements will form part of the Specification in the contract with the successful Contractor.

Contractor are invited to apply for 1 or more lots from the following:

- Oncology Management System (OMS)
- Treatment Planning System (TPS)
- Stereotactic Radiotherapy Treatment Planning System (SRT TPS)
- DICOM Archive (DA)

The Board will accept the highest ranked offer for each individual Lot, within the Board's budget of £2,083,334 (Ex VAT) for this procurement. If no offers fall within the budget for this procurement, or the Board considers that no offer adequately meets the requirement specified herein, then the Board may decline to accept any offer.

2. NHS Lothian's current position

This section provides information particular to the Health Board and details the equipment required by the Health Board as part of the Radiotherapy Capital Equipment Replacement Programme (CERP).

2.1 Products to be purchased:

We currently have access for 36 concurrent users for our TPS and 77 concurrent users for our OMS. We would like, as a minimum, to increase this to 40 TPS users and 80 OMS users. This should be scalable in the future. We can have 10 SRT TPS concurrent users at present and would expect this as a minimum.

1 x Test and development environment or equivalent solution to allow software upgrades, testing and training independent of the clinical system.

2.2 Situation

The new equipment will be installed at the Edinburgh Cancer Centre (ECC), Western General Hospital, Edinburgh, and all systems should be capable of being remotely accessed

The ECC provides services to approximately 1.3 million people across the Lothians, Fife, Dumfries and Galloway and the Borders regions. The ECC sees over 4,500 new referrals each year and the radiotherapy machines deliver over 3,500 courses of radiotherapy, 75% with curative intent.

The routine clinical service operates from 07:30 – 17:30, Monday – Friday, with emergency treatments delivered at the weekend on one linear accelerator as required.

2.3 Existing Radiotherapy Equipment

The Centre has six existing clinical Varian linear accelerators, all equipped with VMAT and IGRT capability. Two stereotactic linear accelerators have additional orthogonal ExacTrac imagers. They offer a range of photon energies of 6, 10 & 15 MV and electron energies of 6, 9, 12, 16 and 20 MeV. All of the accelerators have multi-leaf collimators (MLCs) and both stereotactic machines have high-resolution MLCs. A seventh Linear Accelerator will be added to the equipment during 2022.

All have portal imaging systems and are fitted with a kV image guided system with cone beam CT. An Xstrahl 200kV superficial x-ray unit is being installed (January 2021).

Treatment Planning is carried out on Varian Eclipse TPS, supported by an integrated Varian ARIA Radiotherapy OMS (currently version 13.6) on a dedicated VLAN. Intra-cranial stereotactic planning is carried out on BrainLAB iPlan TPS, including planning for arterio-venous malformations.

Pre-treatment facilities consist of two Philips Brilliance Big-Bore CT Simulators, with associated virtual simulation software (TumourLoc), and Mould Room. Other imaging modalities can be imported into the existing DICOM RT Archive, PukkaJ, such as MRI and PET-CT, from outside the Centre.

The majority of the department's treatment plans for external beam and brachytherapy treatments are created on the Varian Eclipse Planning Systems with 20 (?) workstations, including RapidArc and a 10 (?) licence iPlan network, with the facility to contour on a range of workstations in a dedicated virtual simulation suite. Philips TumourLoc software is used for isocentre download.

The following tables provide further details about the equipment described above. Additional information is available on request. At the time of installation of the new equipment, the centre will have:

Table 1: Linear Accelerators

Local Name	Vendor	Model	Software Version	MLC	Couch top	IMRT/IGRT
LA1	Varian / BrainLAB	TrueBeam Stx	2.7	HD120	BrainLab Robotic	IMRT/VMAT MV/kV IGRT ExacTrac kV
LA2	Varian	Clinac Silhouette	9.0	Millennium 120	IGRT	IMRT/VMAT MV/KV IGRT
LA4	Varian	TrueBeam	2.7	Millennium 120	6 DoF IGRT	IMRT/VMAT MV/KV IGRT
LA5	Varian	TrueBeam	2.7	Millennium 120	6 DoF IGRT	IMRT/VMAT MV/KV IGRT
LA6	Varian	TrueBeam	2.7	Millennium 120	6 DoF IGRT	IMRT/VMAT MV/KV IGRT
LA7	Varian/ BrainLAB	Novalis TX	9.0/ ExacTrac 6.0	HD120	BrainLAB Robotic	IMRT/VMAT MV/KV IGRT ExacTrac kV

Table 2: Pre-treatment Area

Local Name	Vendor	Model	Software Version
CT1	Philips	Brilliance Big-Bore	4.2 (Available until 31/03/21)
CT2	Philips	Brilliance Big-Bore	4.8
CT3	Philips	Brilliance Big-Bore	4.8

Table 3: Oncology Information & Radiotherapy Planning Systems

Name	Vendor	Software Version	Operating System
Aria	Varian	13.6	Microsoft Windows
Eclipse	Varian	13.6	Microsoft Windows
RadCalc	LifeLine Software Inc.	6.2.4.0	Microsoft Windows
iPLAN	BrainLAB	4.5	Microsoft Windows
PerFraction	Sun Nuclear	3.0	Windows Server 2019
Variseed	Varian	9.02	Microsoft Windows
AcQSim/Pinnacle	Philips	9.2	Unix
OncCentra	Elekta	4.6.0.16	Microsoft Windows 10

Table 4: Other Items

Name	Vendor	Details
Dosimetry Check	OSL	IVD transit dosimetry
PukkaJ	PukkaJ	DICOM Archive
LAP Laser	LAP	
IV Contrast Pump	MedRad UK	SX
Superficial x-ray unit	Xstrahl	100 – 200 kVp
HDR	Elekta	Flexitron

2.4 Network infrastructure

Contractor's must assess NHSL's existing network infrastructure to determine and confirm whether or not the new equipment will function on a basis fully capable of meeting this requirement, failing which Contractor's must specify any additional network infrastructure required.

The current network is 1 gigabit Ethernet consisting of cat 5e cabling and some network switches capable of operating at this speed. The new equipment will be required to operate within the Centre's radiotherapy clinical network which runs on a dedicated VLAN, and would have to function securely within NHSL's existing Windows Server 2012 domain. Internet access cannot be provided on this network. Requirements for security (anti-virus, firewall, etc.) and operating system updates must be provided.

Details of requirements for remote support systems must also be provided. Where remote support is provided this will be over the N3 network (or its replacement) and the Contractor will be required to

confirm that it has concluded Code of Connectivity (or its replacement) and will maintain the same (or its replacement) for the period support is provided.

3. Oncology Management System (OMS)

3.1 Mandatory requirements

3.1.1 Data Protection

The solution must be fully compliant with EU General Data Protection Regulation (GDPR).

(M)

[redacted]

3.1.2 eHealth Standards

The Bidder must adhere to all NHS Scotland eHealth standards, policies and guidelines in respect of data definitions, NHS Scotland information governance, technical operation and security.
http://www.ehealth.nhs.scot/resources/standards-library/

The solution must adhere to the NHS Scotland Server Vulnerability and Patch Management Policy. Government legislation also requires the NHS to adhere to Network and Information Systems Regulations (NISR) and Cyber Essentials.

(M)

[redacted]

3.1.3 Audit trail

The system should provide an audit trail of all transactions, including:

- Facilities to enable the post-event identification of specified event (e.g. attempts to gain unauthorised access to information, failed logins) including times and user ID's involved and to produce reports accordingly

- A complete Audit trail of all edited values in all records including; user identifier, workstation identifier, date & time of change, original value and new value so that it is possible to derive the original and any intermediate state of any record and details of the changes as well as read access.

- A full audit trail of where samples have been (route history)

It should also be compatible with NHS national Fairwarning system

(M) confirmation required

[redacted]

[redacted]

3.1.4 Minimum basic operation

The OMS must operate to the same basic level of operation as the existing OMS: Aria 13.6. This includes importing and entering patients' details, uploading documents and creating bookings, prescribing, authorising and approving treatments, importing plans from the TPS and recording treatments and associated images.

(M) confirmation required

[redacted]

[redacted]

3.1.5 Minimum components and technical capabilities

All hardware, software and licenses required, remote access within the hospital network and outside the hospital network, user control and authorisation to be provided. It must have a high level of availability and resilience. The resilience of each component of the solution they are providing, i.e. Hardware, Software, Database, Interfaces etc. must be identified. Include a test system, where configuration changes and upgrades can be tested before clinical implementation; and provide a remote support capability. Remote access to the system for maintenance and problem resolution must be via NHS SWAN.

(M) confirmation required

[redacted]

3.1.6 Third party software:

The offered Products must include all third-party software needed to realise the full functionality of the system. For instance, this might include licenses for word processing software if this is needed for embedding documents within patient records. The Contractor should confirm acceptance of this requirement and explicitly state which, if any, of the Board's existing software licenses will be retained.

(M) provide details

[redacted]

3.1.7 Minimum compatibility

The offered product must be fully compatible with the Board's existing equipment (see Tables 1 to 4), including the network and IT security arrangements, The Contractor must be able to demonstrate such

integration, at the request of the Board, by providing details of a reference site with the same equipment, or by a realistic demonstration of the equipment in use.

(M) confirmation required

[redacted]

3.1.8 Retention of Data

The offered product must include the conversion and transfer of all the data stored in the Board's existing OMS system's database into the new offered system. For each patient in the existing database, the retained data must include patient's demographics, treatment plans, all planning images and treatment records.

(M) confirmation required

[redacted]

3.1.9 Continuity of Service

It is essential that the Board continues to provide a clinical service to its patients, even during the installation and implementation of the offered Products. The Contractor must explain how the offered Products will be installed and implemented without interruption of the Board's clinical service. A full and detailed plan for the installation and implementation of the offered Products must be presented and be acceptable to the Board.

(M) confirmation required

[redacted]

3.1.10 Technical information

Copies of full technical documentation must be provided for all components of the OMS hardware, software and any third-party equipment, including operator's manuals, administrator's manuals and technical manuals describing the system configuration and operating procedures. Information must be provided to permit the user to import and export all patient data, treatment plans and associated files to

peripheral computers / devices not specifically described elsewhere in this document. All system documentation including that for subsequent software revisions must be in English and clearly labelled with the version number and release date. The Contractor shall supply, any information required to permit the OMS to be interfaced to the department's TPS and associated radiotherapy treatment delivery systems, where such information may be released to a third party. Where specific items of software or hardware are required to implement these interfaces, these items must be included in the tender offer. A detailed acceptance protocol covering both supplier and customer aspects must be provided.

(M) confirmation required

[redacted]

3.1.11 Additional fees

The offered Products should be free from any additional fees or software subscriptions that are required for the use of the Products. Furthermore, the Board should not be required to purchase a service contract in order to have full use of the offered Products.

(M) confirmation required

[redacted]

3.1.12 Minimum Requirements for Training

In order to comply with statutory requirements, it is essential that staff across all disciplines are trained in the use of the new OMS (including system operation, commissioning, system administration / configuration, physics support, imaging, maintenance/repair, quality assurance and clinical implementation).

Training will be required for a core group of multi-disciplinary staff and this will be dependent on the equipment / software which is supplied to the Health Boards. The number of days training required will also be dependent on the level of integration that is required for new equipment being installed within the Health Boards.

All training offered must be identified. Details must include which staff group the training is for and the period of time on site. There must be no additional costs for any core training provided off site. Optional training courses, whether on or off site, must be described and costs identified. Contractors must provide information on their recommendations for training of the various multi-disciplinary groups on the basis of discussions with Health Board representatives.

(M) Details required

[redacted]

[redacted]

3.1.13 Minimum Requirements for Equipment Warranty & Support Services

A warranty, commencing from the date of acceptance for the OMS will be provided. The period of the warranty will be twenty-four (24) calendar months from Acceptance. This warrants all modules, components and parts such that any failure during the period of the warranty would be replaced at no extra cost to the Health Board. During the warranty period, the Contractor will rectify faults, as detailed in the Agreement, within the timescales laid out in the Agreement. The Contractor's Engineer will attend on site, at no cost to the Health Board, if required to meet these conditions.

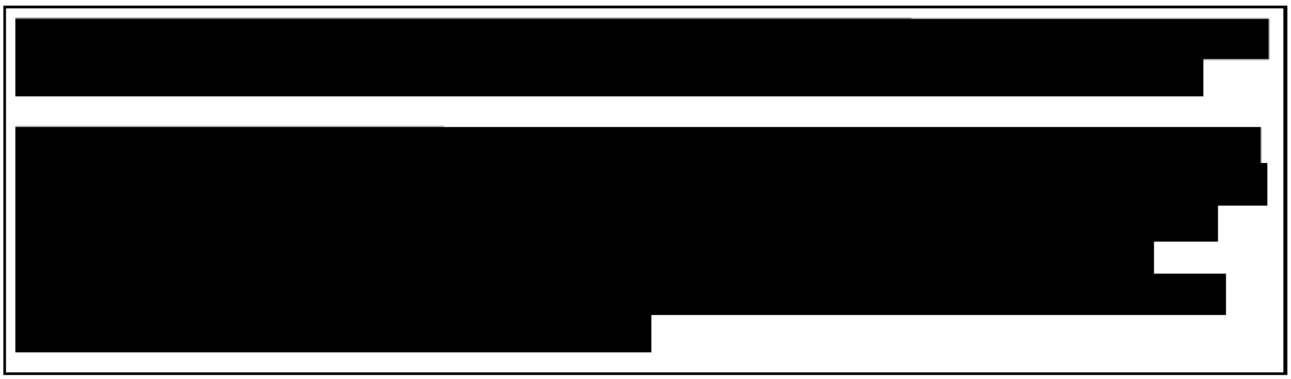
Remote access computer support must be provided to facilitate fault investigation and resolution and should be stated. Details should be provided of how these facilities are provided including confirmation of NHS network connectivity agreements.

Servers should be provided with a minimum 5-year manufacturer's warranty and clients with a minimum 3-year manufacturer's warranty unless other arrangements for support are offered.

Following expiry of the warranty period, the Health Board's staff or other third parties may undertake the service and repair of the OMS hardware. Any parts of the equipment, which must not be calibrated, serviced or repaired by Health Board staff or third parties must be stated.

(M) Details required.

[redacted]



3.2 Evaluated items

3.2.1 Servers and network infrastructure:

The offered Products must include the underlying IT infrastructure that enables full functionality. This includes the computer servers, network devices and supporting software that: store data and images; manage user logins and credentials (e.g. domain controllers); permit user access to the OMS software (e.g. via Citrix); provide backup functions; continuous power supply (e.g. UPS); etc. The ECC has existing structured cabling and any required changes or upgrades to the cabling should be included in the offered Products. However, bidders must confirm that they accept the principle of NHS Lothian, Fife and Borders procuring workstation and server hardware for the proposed system through existing NHS Scotland or alternative Government / Public Sector framework contracts.

If the Contractor proposes retaining items from the Board's existing OMS, the description should explain how the new and retained items will work together to achieve the requirements. In particular, the Contractor's response should include a description of the capacity of the system, such as number of users who can connect simultaneously (e.g. via Citrix and/or locally), storage capacity (e.g. in terms of number of CT scans), network speed, etc. Also the details of the backup process/software and media, such as network attached storage – ideally, the backup solution should be as automated as possible and not involve the manual exchange of tape cassettes. The backup must include patient-related data, user-related data, configuration and system set-up data.

The solution must offer disaster recovery functionality. In the event of failure, the system must automatically retain data / results and allow this to be retransmitted. The ability to manage upgrades in a way which minimises disruption for the service must be provided. Any limitations running in a Dynamic Host Configuration Protocol (DHCP) environment should be stated.

(E) provide details

[redacted]

3.2.2 Client workstations:

The offered Products must include the computer workstations ('clients') that are required for operators to access the OMS system. These clients need to be distributed throughout the ECC. Most of the Board's existing OMS system clients are over 5 years old and the Board wishes to replace them ideally with a virtualised solution. There is a requirement for 80 concurrent users in total, or an adequate amount to cover our needs for up to an 8 linac department. This should include our remote needs. Any solution requiring remote connection software must include the necessary software licenses as part of the cost of the offered Products. If any of the Board's existing software licenses (e.g. Citrix) are to be retained in order to provide a portion of the requirement, this should be explicitly stated along with the number of new licenses that will be included in the offered Products.

The client display screens should be of sufficient quality to review medical images, such as radiographs and CT scans.

One client will be located at each of the control desks of the Board's six (soon to be seven) linacs. These seven clients have special requirements: each client needs dual display screens at the control desk; each should have a remote display, keyboard and mouse provided in the treatment room (e.g. via a KVM switch); each requires two network connections so that they can connect simultaneously to the Radiotherapy network and items of dosimetry equipment.

In addition to the access provided by the new client workstations, operators will require access to the OMS system from existing Board workstations connected to the Board's network. Such access might be provided using (e.g.) Citrix or remote desktop solutions. These workstations are distributed throughout the ECC and some operators will access the OMS system from their homes via the Board's 'Direct Access' software. The method of connection (Citrix, remote desktop, etc.) must be acceptable to the Board. The Contractor should describe in detail its proposed solution for how operators will connect to the offered Products via existing Board workstations, which are connected to the wider Board IT network.

The Contractor should provide details of client workstations to be provided with the offered products and describe how the client workstations included with the offered Products will achieve the required access, capacity and functionality.

(E) provide details

[redacted]

3.2.3 Interface with the Board's HIS:

The offered Products should interface with the Board's Hospital Information System (Trak) so that patient demographics can be imported into the OMS. Ideally, relevant patients will be identified and imported automatically, e.g. based on attendance at specific Oncology clinics. The offered Products should also allow an operator to select, and subsequently import, a specific patient from Trak, or manually enter a new patient in the OMS. It should also allow the reverse process, where the HIS imports data from the OMS. The Board uses CHI numbers as the primary patient ID and the offered Products should be compatible with this practice. Details of the Board's HIS can be provided upon request. The Contractor should describe how, and to what extent, the offered Products meet this requirement.

(E) provide details

[redacted]

[redacted]

3.2.4 Electronic referrals and prescriptions:

The offered Products should have functionality that allows an operator (e.g. Oncologist) to create an electronic request for radiotherapy treatment, also called a referral, for a given patient. Electronic referrals should allow operators to enter a range of information, such as details about anatomical location of the treatment site, the required CT scan (scan type, length, the need for IV contrast, etc.), the proposed dose and fractionation, the presence of a pacemaker, special clinician instructions, etc. In addition, the offered Products should have the ability to create an electronic prescription for a given patient, specifying the dose and number of fractions to be delivered, for a course of treatment. Ideally, the prescription functionality should allow the specification of dose to various targets and organs for a single course of treatment and permit the entry of specific Oncologist's instructions relevant to treatment delivery. The offered Products should provide the ability for an operator to approve electronic prescriptions, perhaps using a password, and prevent the prescription from being inadvertently changed once it is approved. This will also be required for peripheral clinics. The Contractor should describe how, and to what extent, the offered Products meet this requirement.

(E) provide details

[redacted]

[redacted]

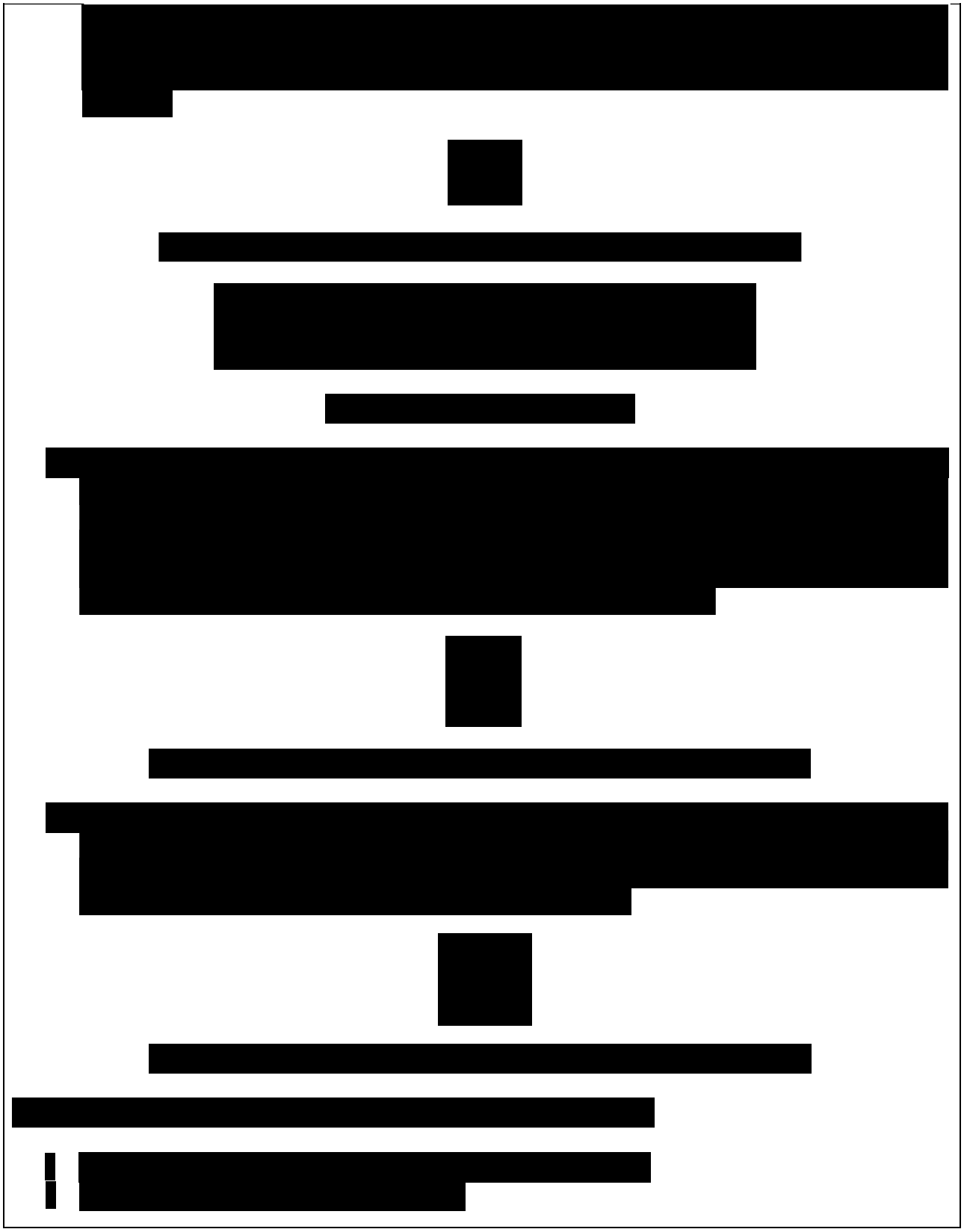
[redacted]

3.2.5 Patient-specific notes and instructions:

Operators, such as radiographers, nurses or Oncologists, should be able to use the offered Products to record information electronically from clinics such as biometric data (e.g. body weight), treatment toxicities, quality of life measures, general observations, prescribing of drugs, additional instructions for patient care, etc. via a combination of standard dialog boxes and free text. In addition, the offered products should provide functionality to highlight critical information, such as patient allergies, as well as operational information such as patient location (ward number or out-patient), the need for patient transport, etc. The offered Products should allow operators to upload electronic documents (e.g. in PDF or MS Word format) into a patient's record. Such information should be stored in the OMS database along with other information relevant to a specific patient. The Contractor should describe how, and to what extent, the offered Products meet this requirement.

(E) provide details

[redacted]



3.2.6 Scheduling of appointments:

The offered Products should include functionality that allows operators to create bookings for all necessary appointments that comprise the 'patient journey', as well as create printed copies of a patient's appointments, so that the patient can be provided with the relevant information. In addition, the offered Products should allow operators to easily view appointments in a variety of ways, for instance a list of all of a patient's appointments; a list of all appointments on a linac for a given day; etc. The Contractor should describe the functionality of the offered Products and to what extent the offered Products meet this requirement.

(E) provide details

[redacted]

3.2.7 Communication and integration with the TPSs:

An efficient clinical workflow requires that the communication between the OMS and the TPSs (see Table 3) is as seamless as possible. The offered Products should transfer, or make available, to the TPSs all the data necessary for the creation of radiotherapy treatment plans. Once a treatment plan has been created in the TPS, the offered Products should be able to import or to receive and store all the related data for later use during treatment delivery. Finally, the offered Products should include functionality to manage the review and approval of treatment plans. Operators should be prevented from inadvertently changing dosimetrically important parameters once a treatment plan has been approved. The Contractor should describe the functionality of the offered Products, as it relates to these requirements, as well as how, and to what extent, the offered Products meet this requirement.

(E) provide details

[redacted]

[redacted]

3.2.8 Communication and integration with the linacs and other equipment:

An efficient clinical workflow requires smooth communication between the OMS and the Board's linacs and other equipment (see Table 1, Table 2 and Table 4). Under control of an operator, the offered Products should transfer, or make available, to a linac all the data necessary for positioning of the patient and delivery of the treatment. Such data includes reference images and CT scans needed for x-ray image guidance. The offered Products should be able to transfer this data to any of the Board's linacs that the operator chooses.

Following the completion of a treatment, the offered Products should be able to automatically upload the recorded treatment parameters and any images acquired at the time of treatment from the linac into the OMS. The offered Products must be able to complete this task for all of the Board's linacs.

Should a linac be operated in 'File mode' or 'stand-alone' mode for a period of time, the offered Products should allow an operator to subsequently transfer the patient records stored on the linac to the OMS. The transfer should be as automated as possible and be able to write the data into the correct patient records, based on patient ID and demographics.

Any and all required hardware and/or software upgrades/updates to our existing linacs, CT scanners or other equipment must be detailed, and clearly stated which items are mandatory, and which may be optional. All mandatory upgrades/updates should be included in the quotation, with costings given for optional changes.

The Contractor should describe the functionality of the offered Products, as it relates to these requirements, as well as how, and to what extent, the offered Products meet this requirement.

(E) provide details

[redacted]

[redacted]

3.2.9 Monitoring and reviewing treatment progress:

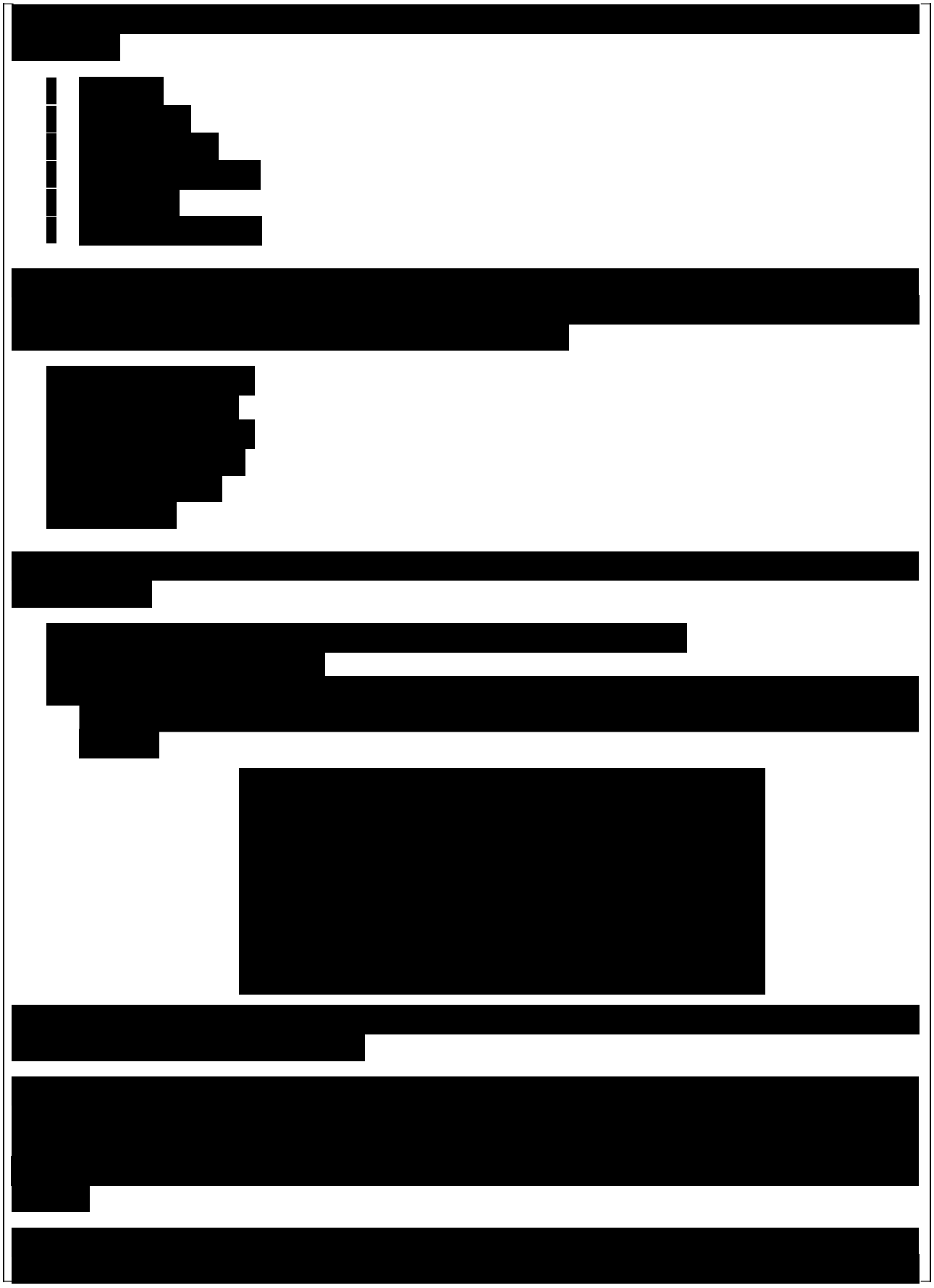
The offered Products should include functionality to allow operators to regularly review patients' treatment progress (also known as 'chart checks'), as well as review and electronically approve on-treatment images. The information available to operators should include, but is not limited to, items such as the number of fractions delivered up to a given date, the dose delivered, the images scheduled for upcoming fractions, instructions and alerts entered previously during the course of treatment, etc. The offered Products should also allow operators to enter notes and alerts for upcoming treatment fractions.

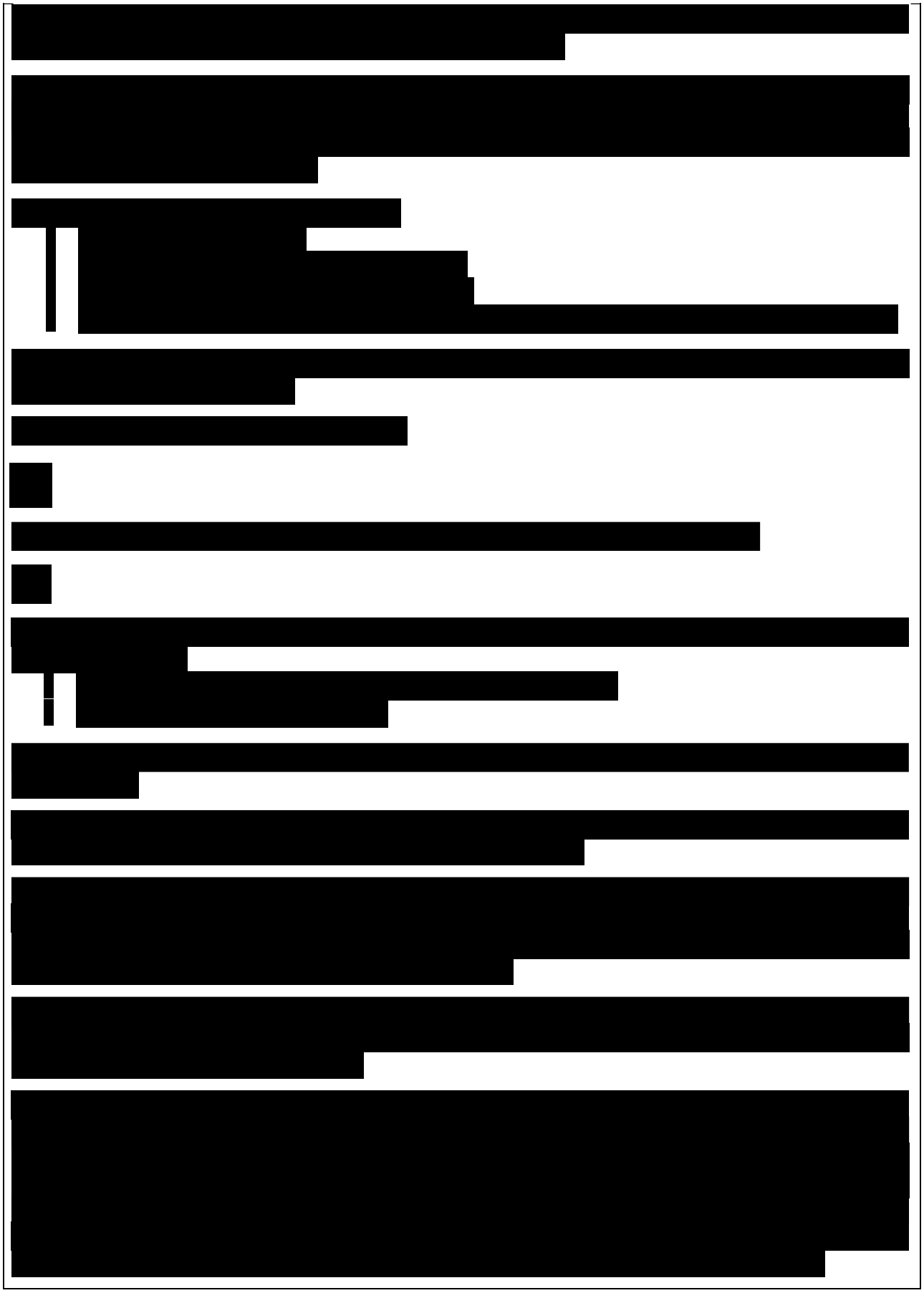
In the course of reviewing on-treatment images, the offered Products should allow the operator to alter 'window and level' for pixel-values, apply image enhancement filters, match 2D and 3D images to references images, assess shifts in patient position applied at the time of treatment, and approve (e.g. via password) images and image matches. There should be provision for assessing 4D images and other advanced features available in the TPS.

The Contractor should describe the functionality of the offered Products, as it relates to these requirements, as well as how, and to what extent, the offered Products meet this requirement.

(E) provide details

[redacted]





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3.2.10 Data collection and analysis:

The offered Products should allow operators to use software tools to retrieve and analyse a broad range of data for individual patients, for defined groups of patients, for individual items of equipment (e.g. linacs, CT Simulator, etc.), and for specific tasks. The offered Products should provide the Board with the ability to create customised data queries, in order to meet variable needs for data analysis.

The offered Products should also have the ability to capture statistics on specific activities. This forms the basis of the Board's reporting of workload data for the UK Radiotherapy Dataset (RTDS), which is currently compiled by Public Health England. The offered Products must be compatible with the collection and submission of data for RTDS.

The Contractor must give a detailed description of the functionality of the offered Products, as it relates to these requirements, as well as how, and to what extent, the offered Products meet this requirement.

(E) provide details

[redacted]

3.2.11 Control of workflow and paperless working:

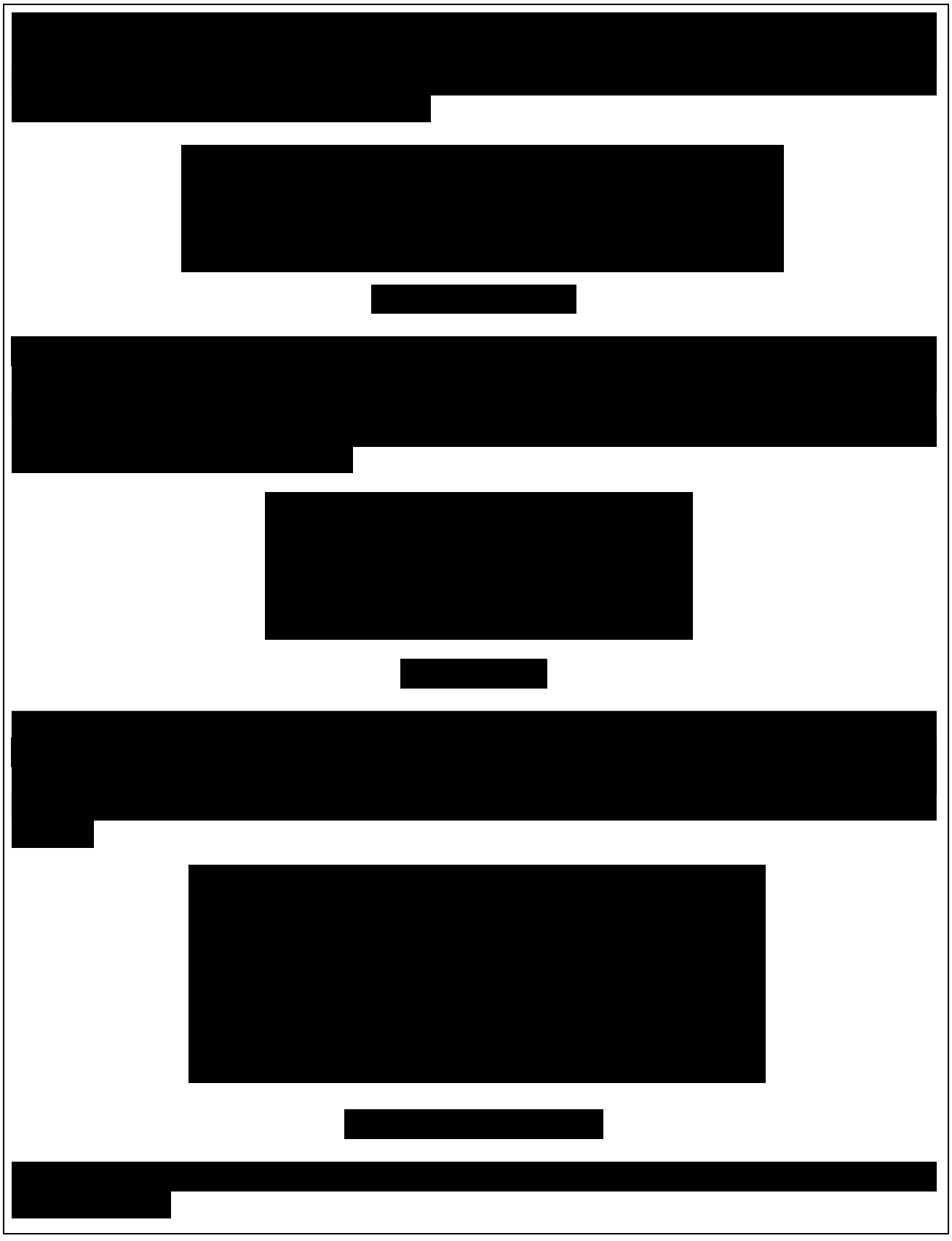
The Board aims to use paperless workflows more extensively. The offered Products should include software that provides a method for appropriately sequencing, approving and monitoring the tasks needed over a given patient's treatment journey. For instance, certain tasks and appointments must be arranged in the correct order and at appropriate intervals in order to successfully plan and deliver a patient's treatment. It is necessary for some tasks to be completed or approved before a subsequent task can start and the offered Products should include functionality to ensure that a givens task's prerequisites are completed prior to allowing an operator to complete the task itself. Ideally, this functionality should allow the creation and utilisation of templates that apply for different categories of patients. Such a template would contain the basic sequence of appointments and tasks for a range of categories of patients.

Ideally, the offered Products should include functionality to ensure that tasks are fully complete before being marked as 'completed'. For instance, operators could be presented with a list of prompts, each one associated with an action that must be completed, which the operator would need to acknowledge before marking the overall task as 'complete'.

The Contractor should describe the functionality of the offered Products, as it relates to these requirements, as well as how, and to what extent, the offered Products meet this requirement.

(E) provide details

[redacted]



3.2.12 System configuration and management:

The design of the offered Products should permit authorised and trained Board staff to undertake maintenance tasks, fault-find, run diagnostic tests and modify a range of System settings and parameters. The Contractor should describe the features of the offered Products that permit such access. If granting access to these features requires that Board staff receive specialised training from the Contractor or a third party, then the Contractor should clearly state what training is required and include the training within the offered Products

(E) provide details

[redacted]

3.2.13 Compatibility with the Board's operating procedures:

The offered Products should be as compatible as possible with the Board's current operating procedures in order to ensure that the Board can continue to deliver the radiotherapy service in a safe, efficient and effective manner. Therefore, the Contractor should identify a radiotherapy centre where the offered Products are in use and can be viewed by the Board

(E) provide details

[redacted]

3.2.14 Network Configuration and IT Security:

The Board's current R&V system resides on its own network (referred to locally as the "Radiotherapy network"), separated from the wider Board IT network via a firewall and high-speed network switches. The Radiotherapy network has its own domain controllers and users have different credentials from the ones used on the Board's network. This arrangement protects both networks, allows the current system to satisfy all Board IT policies, and is the Board's preferred network configuration. However, should the Contractor wish to propose an alternative network arrangement, then the new configuration must be acceptable to the Board; the Contractor should describe the proposed network configuration and explain how the alternative arrangement can achieve the same level of IT security and satisfy all Board IT policies

(the written policies can be supplied upon request). If the Contractor wishes to retain the current configuration, then the contractor should explain whether, and how, the existing user credentials used on the Radiotherapy network can be retained (which is the Board's preference) or whether all users will need new credentials.

The offered Products should have the ability to control access for individual users (operators) and permit the Board to attribute specific actions to specific users; generic login credentials (e.g. a single username and password used by several operators) are not acceptable to the Board. For instance, if a user performs a task using the offered Products, then at some later time, it should be possible for (e.g.) another user or system administrator to determine the identity of the person who performed the task in question.

In addition, the offered Products should allow the Board to control the access privileges of individual users and defined groups of users. For instance, it should be possible to prevent certain categories of users from performing certain tasks.

The anti-virus software, Cisco AMP, is used across all Board computers and updates to operating systems are applied regularly, with the exception of computers classed as medical devices. The Contractor should explain whether, and how, anti-virus software can be installed on computers included with the offered Products and whether, and how, regular software updates can be applied (including operating system updates). If the Contractor requires a specific anti-virus software package different from the Cisco AMP software used by the Board, then the appropriate software and licenses should be included with the offered products. If the offered Products include computers that are classed as medical devices, these should be separated from the wider Board network by firewall(s) if the computers in question cannot receive updates or have anti-virus software installed. The Contractor should describe the measures taken to separate such computers from the rest of the network, including any firewalls, and more generally explain the features of the offered Products that minimise the risk from malware or external attack. We use Ivanti device and application control for managing USB connected devices

(E) provide details

[redacted]

[redacted]

[redacted]

3.2.15 Benefits, Risks & Consequences of Change

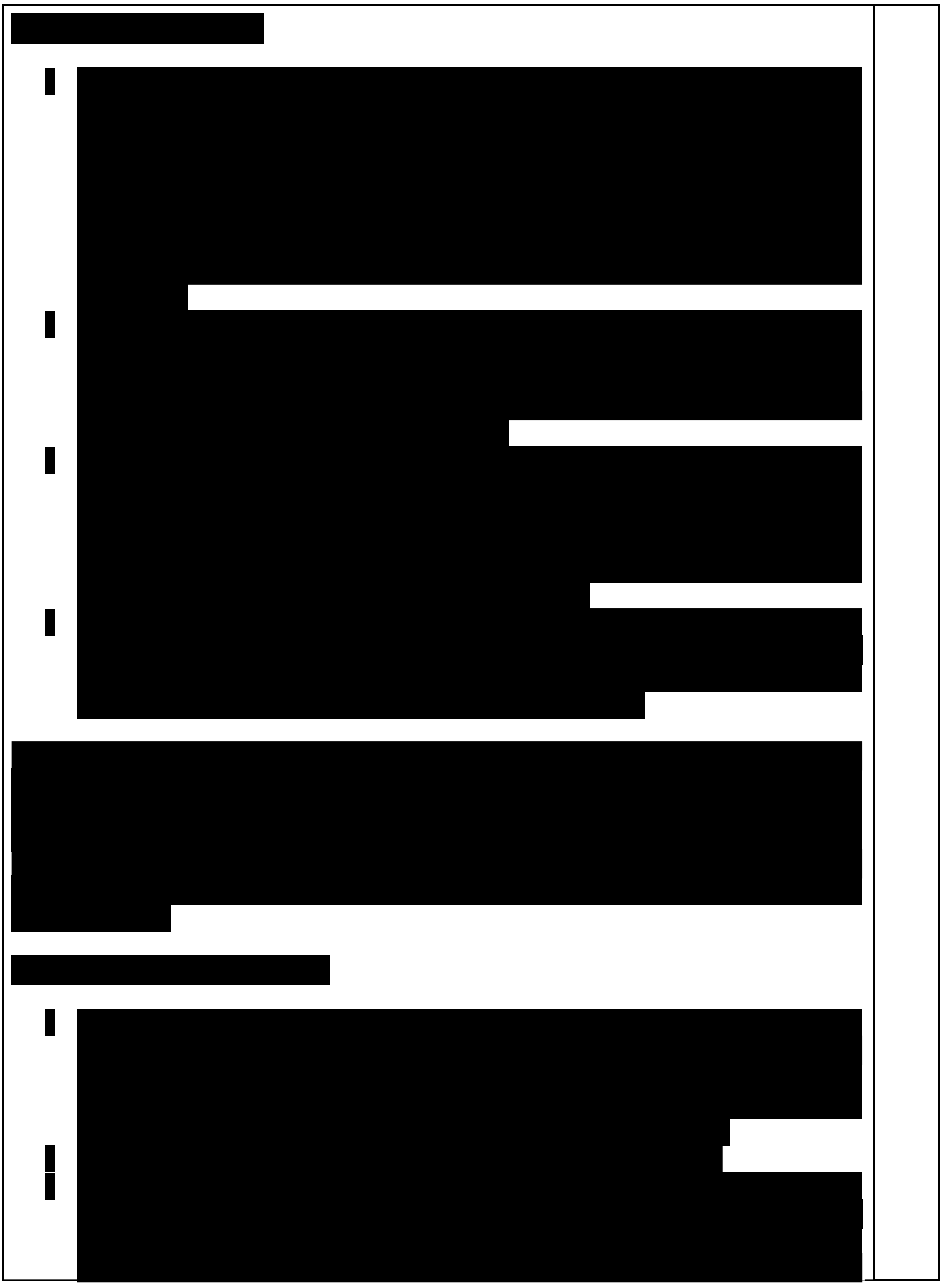
Radiotherapy treatment delivery is a complex, multi-stage process incorporating many inter-related stages of booking, simulation, planning and treatment and draws on multiple, specialised human and technical resources. The Health Board has an existing set of protocols and work processes that have been developed to deliver a safe service and the benefits, risks and consequences of implementing new equipment and software need to be assessed as part of this tender.

The OMS is a core component of the radiotherapy clinical pathway and all staff members need to use it for various tasks described previously.

The Contractor must provide sufficient details to allow assessment of the consequences and/or risks of implementing their offered OMS. Details to be provided include the compatibility with the existing knowledge base and skill set of staff in all of the areas within the radiotherapy department, and the estimated time to educate staff for new features and functionality, the overall length of training, and the clinical implications from the potential delay in implementing new features. The Contractor should indicate the expected benefits to be gained from introducing this functionality and feature set, particularly those areas identified above.

In addition, the Contractor must provide technical details of any arrangements to facilitate migration, or integration, of patient information stored within the department's existing OMS into the patient information storage system of the tendered equipment.

Contractor Response	(E)
[redacted]	



[redacted]

3.2.16 Support contract

A fully comprehensive support contract which satisfies the following requirements should be offered to apply for a period of 3 years following expiry of the warranty.

The contract should provide for resolution of all software and hardware faults. A separate option should be provided for the additional provision of all major updates to software.

For systems with hardware installed locally at the ECC, the contract should provide for all spare parts coverage. If certain component parts are excluded from the proposed support contract, these must be specified.

Technical support and advice by telephone and will be available by telephone, free of additional charges, and without limitation, from 08:30 to 18:00, Monday to Friday, for the lifetime of the equipment. This excludes Christmas Day and New Year's Day.

Remote access computer support must be provided to facilitate fault investigation and resolution. Details should be provided of how these facilities are provided including confirmation of relevant NHS network connectivity agreements.

Contractor Response.	(E)
[redacted]	

[redacted]

3.3 Information required

Bidders should provide detail of the network connectivity requirements for the proposed solution indicating: -

a. Number and type of connections required in each location
b. Connection speed/minimum bandwidth required for functionality over
    i. local area network
    ii. wide area / SWAN networks

(I) provide details

[redacted]

There should be a clear identification of what hardware is included in the tender submission and that which is optional. All optional items should be clearly identified. All hardware to be supplied as part of the tender should be clearly identified. Details of processors, graphics cards, memory and disk storage should be provided along with any network interfaces

(I) provide details

[redacted]

[redacted]

Details of the workstation monitors should be provided, including viewable screen dimensions & aspect ratios, colour depth and use of multiple screens.

(I) provide details

Details of the operating system(s) used by the OMS should be provided (servers and clients). The computer operating system should be able to be supported for the lifetime of the OMS, or upgraded as required. There should be a clear identification of what operating system & network access licences are included in the tender submission.

(I) provide details

[redacted]

Details of additional software expected / required to be installed on the servers / clients should be provided. It should be noted that the Health Board's current Anti-Virus /Anti-Malware solution is CISCO AMP and their Encryption solution is Bitlocker and Ivanti for USB devices.

(I) provide details

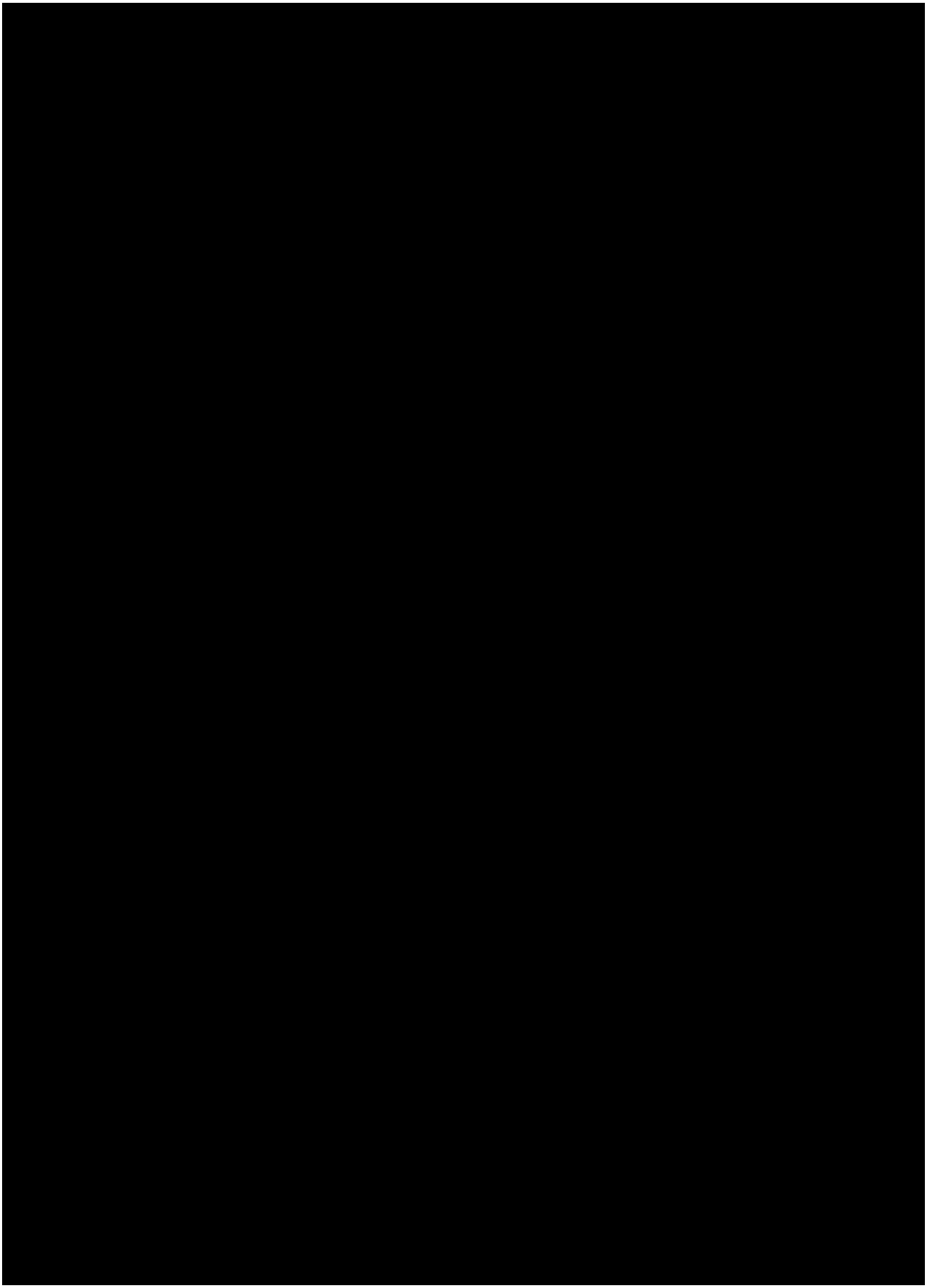
[redacted]

Details of DICOM compliance and any interfaces or drivers should be provided. Where appropriate, the format in which images and data are stored should be identified and described.

Details of the capability of an HL7 connection to a Hospital Information System (Trak) should be identified and described.

(I) provide details

[redacted]



[redacted]

[redacted]

Please describe any support which would be available to assist the Cancer Centre in installation, commissioning (including data acquisition) and customisation of the treatment planning and delivery systems.

(I) provide details

[redacted]

Any supporting equipment will be supplied by the Board beforehand.

(I) provide details

[redacted]

[redacted]

Prior to delivery of the equipment, the Health Board must be supplied with a complete list of all items to be delivered with information on package sizes and weights.

(I) provide details

[redacted]

Pre-installation site examinations, delivery and installation of the equipment shall be free of any additional expense to the Health Board. The Contractor must provide any special transport, lifting or handling equipment

(I) provide details

[redacted]

The fabric and fittings of the building must be protected at all times during delivery and installation. Any special requirements or arrangements, which the Contractor requires the board to undertake, must be notified to the Health Board in writing at least four weeks before delivery and/or installation commences.

(I) provide details

[redacted]

Dates for delivery of the equipment and dates and duration of the installation will be agreed by the Health Board with the Contractor and confirmed in writing. In each case the equipment must be delivered or installed within 6 weeks of the agreed date. Written notification must be given of any equipment that will be delivered at a later date than that for the main system.

(I) provide details

[redacted]

If the offered Products require any consumable supplies, such as backup tapes, then the Contractor should explicitly and clearly list such consumables. The description should include an estimated quantity of the consumable required per unit time (e.g. per annum).

(I) provide details

[redacted]

The Contractor should identify any components of the offered Products that are likely to require replacement at intervals over the lifetime of the offered Products (the Board considers the lifetime of the OMS to be 5 years from the date of acceptance).

(I) provide details [redacted]

If the Contractor has any planned developments or major changes to the offered Products that it intends to release during the Warranty Period of the offered Products, then the Contractor should describe these planned developments along with any implications for the use of the offered Products by the Board, taking account of the local radiotherapy service as described in Section **Error! Reference source not found.**. The Board wishes to provide as modern a service as possible. If the Contractor feels that any impending product release may be of interest to the Board, then it should briefly describe the impending additional product and offer it as an optional extra, along with the offered Products.

(I) provide details [redacted]

Please indicate the likely number of software releases per year and describe how customers will be informed of the software update availability.

(I) provide details. [redacted]

4. Treatment Planning System (TPS)

4.1 Mandatory requirements

4.1.1 Data Protection

The solution must be fully compliant with EU General Data Protection Regulation (GDPR).

(M) confirmation required Yes – Eclipse and Velocity are fully compliant with this request.

4.1.2 eHealth Standards

The Bidder must adhere to all NHS Scotland eHealth standards, policies and guidelines in respect of data definitions, NHS Scotland information governance, technical operation and security.
http://www.ehealth.nhs.scot/resources/standards-library/

The solution must adhere to the NHS Scotland Server Vulnerability and Patch Management Policy. Government legislation also requires the NHS to adhere to Network and Information Systems Regulations (NISR) and Cyber Essentials. We use Ivanti device and application control for managing USB connected devices

(M) confirmation required Yes – Eclipse and Velocity are fully compliant with this request.

4.1.3 Audit trail

The system should provide an audit trail of all transactions, including:

- Facilities to enable the post-event identification of specified event (e.g. attempts to gain unauthorised access to information, failed logins) including times and user ID's involved and to produce reports accordingly

- A complete Audit trail of all edited values in all records including; user identifier, workstation identifier, date & time of change, original value and new value so that it is possible to derive the original and any intermediate state of any record and details of the changes as well as read access.

- A full audit trail of where samples have been (route history)

It should also be compatible with NHS national Fairwarning system

(M) confirmation required Yes – Eclipse and Velocity are fully compliant with this request.

4.1.4 Minimum basic operation

The TPS must function to the basic level of the existing TPS, Eclipse 13.6. This includes the import of volumetric images, including 4D, matching, outlining, creation of plans including VMAT plans and

verification plans, DRRs, approval and export to the OMS. It must be capable of DICOM query/retrieve for all DICOM-data sets.

(M) confirmation required

Yes – Eclipse and Velocity are fully compliant with this request as Eclipse is the existing TPS at the Board's facility. An upgrade to the existing Eclipse V13.6 to Eclipse V16.1 will be included as part of this tender.

4.1.5 Palliative out of hours service

The TPS must be capable of being utilised within the department's weekend palliative service to create simple non-modulated fields to be planned and delivered on the same day. This should be inclusive of a simplified calculation and workflow to enable staff groups not involved directly in treatment planning to produce simplified clinical plans. Please show an example of this.

(M) confirmation required

Yes – Eclipse is fully compliant with this request.

Eclipse™ Treatment Planning System is designed to increase the clinical workflow efficiency in the Radiation Therapy department with wide-ranging solutions that create standard practices, reduce time consuming tasks and improves clinical skills to achieve high quality patient care.

Eclipse is fully integrated within the Varian eco-system offering the advantage of a seamless workflow that can reduce data transfer errors and raises the bar for patient safety. In a Varian environment, Eclipse and ARIA® oncology information system share a unified database, so any patient or plan present within ARIA will be automatically available in Eclipse without any user interaction. This enables all staff groups using ARIA to be familiar with the Eclipse workspaces.

The structure of Eclipse is intuitive for all staff groups containing an integrated workspace for image registration, contouring, 3D conformal, conformal arc, IMRT and VMAT planning.

From Simple to Elaborated 3D

In Eclipse, the user can accurately define the fields to be treated in a three-dimensional space, automatically centring the fields at the tumour volume.

To have fields that are as conformed to the target as possible and protect healthy tissue, Eclipse offers a wide selection of beam modifiers:

- Wedges - Enhanced Dynamic Wedge™ Blocks
- Multi Leaf Collimators: Varian MLC (52, 80 and 120 slats), Brainlab MLC, Elekta MLC, Siemens MLC
- Bolus: can be turned on or off for fields and can be reused between different plans
- Compensators

To facilitate the shape of the field, the software automatically places the opening of the MLC or outer block with a defined margin around the selected structure. Margin definition tools can also be used to automatically define shielding blocks.

Fields can be flexibly rotated in the coordinate system in the BEV and in the 2D view of the image. The graphical field setup tools make it easier to place the collimator jaws around the PTV in the BEV. When desired, the user can also define the exact numerical positioning of field parameters or review the field information that summarizes the critical parameters for each field. Isocentric fields can be grouped together to enable the movement of many fields in the new isocenter at the same time.

Three-dimensional views (BEV or the "observer's Eye" view) can show digitally reconstructed Radiographs (DRRs) as reference images. DRR images are reconstructed in real time, and automatically reflect changes to field geometry.

Automation of the planification process can be achieved with the use of **Templates and Clinical Protocols**, which contain a set of predefined values that guide the treatment planning process. Its purpose is to speed up treatment planning and to ease the clinician's and planner's workload in typical treatments such as palliative cases. Ensuring all staff groups can easily complete tasks.

A clinical protocol consists of:

- Pre-defined set of structures.
- Pre-defined set of protocol plans defining the treatment phases (for example the original treatment and its boost).
- Plan template - contains the standard plan characteristics.
- Clinical Goals - define the intended dose distribution and set of evaluation priority for the target and critical organs realized by the plan. The overall prescription is a collection of clinical goals that limit the total dose distribution for the target and critical organs.
- Review settings - Define structures included in the DVH.

Eclipse offers advanced algorithms not only for calculation but also for optimization of radiation treatment plans. They are available for a range of treatment modalities including Photon, Electron, Brachytherapy and Proton Therapy.

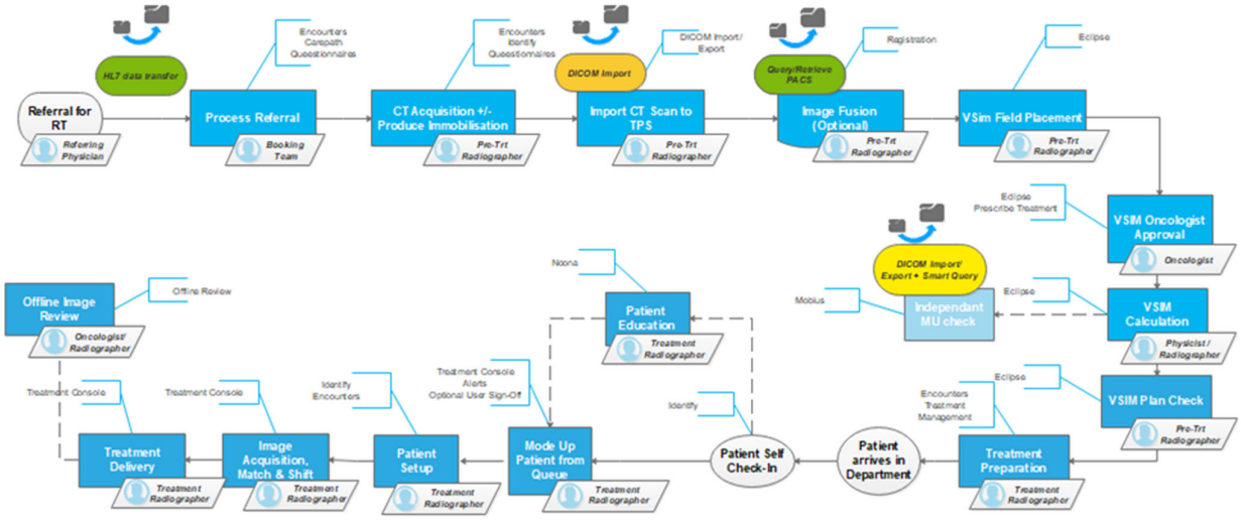
Accuracy

Eclipse boasts a number of primary calculation algorithms that offer many advantages over the more common Collapsed Cone Convolution (CCC) or Pencil Beam Calculation (PBC) algorithms whilst achieving comparable accuracy and reproducibility with an equivalent full Monte Carlo calculation.

AAA is a 3D pencil beam convolution/superposition algorithm that uses separate Monte Carlo derived modelled for primary photons, scattered extra-focal photons, and electrons scattered from the beam limiting devices. The lateral dose deposition characteristics are modelled with six exponential curves. The functional shapes of the fundamental physical expressions in the AAA enable analytical convolution, which significantly reduces the computational time. This algorithm accounts for tissue heterogeneity anisotropically in the entire three-dimensional neighbourhood of an interaction site, by using photon scatter kernels in multiple lateral directions (Scatter Kernels). The final dose distribution is obtained by the superposition of the dose calculated with photon and electron convolutions.

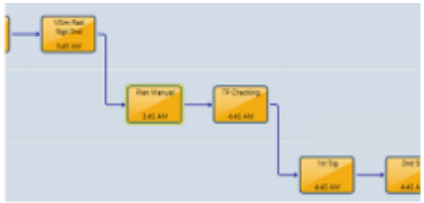
AcurosXB algorithm was developed to provide accurate and rapid dose calculations for external photon beam radiotherapy treatments ranging from 4 MV to 25 MV, with calculation grid voxel sizes ranging from 1 to 3 mm. In external photon beam radiotherapy, heterogeneities introduced by materials such as lung, air, bone and implants, may significantly influence the dose distribution in the patient, especially in the presence of small or irregular fields. Through solving the linear Boltzmann transport equation (LBTE), AcurosXB directly accounts for the effects of these heterogeneities.

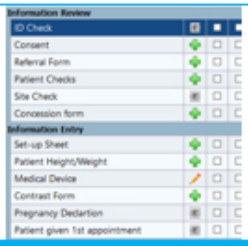
See below for an example of this in a Palliative workflow diagram. Mobius has been used in this example, but any MU check software can be used in its place in the workflow.



Process Referral

The user will process the referral guided by an encounter, schedule the corresponding carepath templates and book patient treatment appointments.





CT Acquisition

The user will review IR(ME)R justification for the CT scan. The patient is positioned on the CT couch and the planning CT acquired. The user will document the patient position in the encounter's workspace.

Import CT Scan to TPS

The DICOM Workspace is integrated within Aria/Eclipse.
Simple configuration of import filters enables quick import from any destination folder.
Aria/Eclipse will check if the patient already exists in the database or enables the creation of a new patient.
The system verifies the imported data for any issues and various file inter-connections, such as dose objects to their related planning objects.
Any issues are flagged to the user in a final summary.

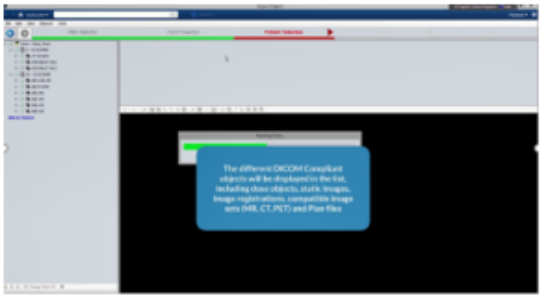


Image fusion (optional)

Image registration in Eclipse supports rigid and deformable image registration, including automated, manual, and point-based registration.
Steps to register an image:

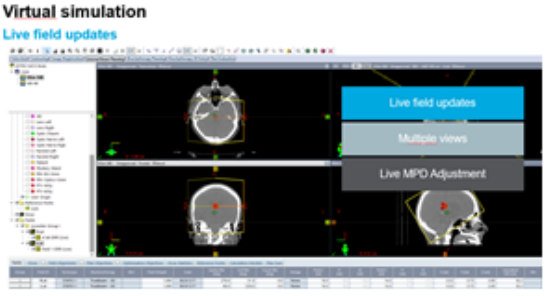
- Select registration type.
- Select source and target image
- Perform rigid registration using chosen method

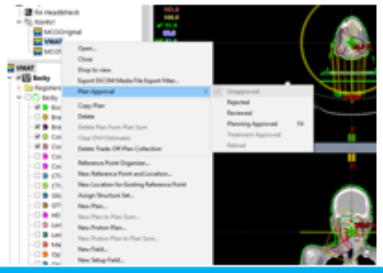
If deformable required, select this after rigid is performed
All registrations can be approved within Eclipse. Approval are password protected.

VSIM Field Placement

Eclipse's virtual simulations tools sit within the external beam planning workspace. These tools enable:

- Simple field creation/oppose/mirror beam tools
- Centre Isocentre tool within placed field borders
- Visualisation of field entry/exit on a rendered image.
- Live DRR creation and updates during field placement
- Live MPD adjustments





VSIM Oncologist Approval

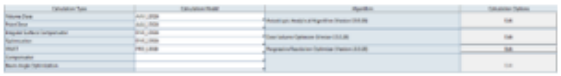
Plan approval in Eclipse follows a simple wizard
To communicate the stages of planning and prevent accidental/unauthorised changes.
Plan can be 'Reviewed', 'Planning Approved' & 'Treatment Approved'. The staff member responsible for each approval stage will be dependent on each individual department workflow.

VSIM Calculation

Dose calculation for any plan is performed in the external beam planning workspace. For virtual simulation the following tools are available:

- Reference point creation and normalisation tools
- Dose calculation with AAA, Acuros.
- Heterogeneity correction on/off

Calculation model selection



Example whole Brain virtual simulation

VSIM Plan Check

Plan checking can also be performed in the external beam planning workspace.
ESAPI scripting can also be used to check key plan parameters to further automate this step.

Independent MU Check

An export filter can be configured to automate the export of the plan to MobiusCalc with a single mouse click. DICOM Query retrieve functionality will automatically pull in the data into Mobius to complete the MU check within minutes, regardless of the planning technique.
Mobius provides simple, fast, intuitive 3D dashboards with quick pass/fail results at a glance.
More detail is provided with a further click to enable:
Comparison on the plan DVH Vs Mobius 3D
Compare the dos distribution with Gamma analysis.
A QA report can be automatically saved into Aria using e-Doc functionality.

Treatment Preparation

Once the plan is approved the user schedules the treatment and images in ARIA and treatment approves ready for treatment.

4.1.6 Minimum components and technical capabilities

All hardware, software and licenses required, remote access within the hospital network and outside the hospital network, user control and authorisation to be provided. It must have a high level of availability and resilience. The resilience of each component of the solution they are providing, i.e. Hardware, Software, Database, Interfaces etc. must be identified. Include a test system, where configuration changes and upgrades can be tested before clinical implementation; and provide a remote support capability. Remote access to the system for maintenance and problem resolution must be via NHS SWAN.

(M) confirmation required

Yes - Eclipse and Velocity are fully compliant with this request.

4.1.7 Minimum compatibility

The offered product must be fully compatible with the Board's existing equipment, including the network and IT security arrangements, The Contractor must be able to demonstrate such integration, at the request of the Board, by providing details of a reference site with the same equipment, or by a realistic demonstration of the equipment in use.

The offered product must include the conversion and transfer of all the data stored in the Board's existing TPS system's database into the new offered system. For each patient in the existing database, the retained data must include the patient's Treatment plans and all planning images.

(M) confirmation required

Yes – Eclipse and Velocity are fully compliant with this request. All the Board's existing data will be maintained as part of the ARIA/Eclipse upgrade included with this tender.

The following sites have been listed below as reference sites with the same equipment, following an upgrade of the board's existing Eclipse TPS.

- Altnagelvin Area Hospital, North West Cancer Centre, Londonderry
- The Beatson West of Scotland Cancer Centre, Gartnavel General Hospital, Glasgow
- Clatterbridge Cancer Centre, Liverpool
- Hull University Teaching Hospitals NHS Trust, Castle Hill Hospital, Hull
- Royal Surrey County Hospital, Guildford
- University College London Hospitals NHS Foundation Trust, London

Unified database

In a Varian environment, Eclipse and ARIA® oncology information system share a unified database, so any patient or plan present within ARIA will be automatically available within Eclipse without any user interaction. This connection is maintained with the Varian linear accelerators, so all treatment and imaging records are also stored within the same unified framework. Through this integration with the TPS, OIS and Varian Linac, workflows are smooth, efficient, seamless and above all safe.

This is important to eliminate transcription and redundant data entry, which is time dependent. This also removes the human factor of importing/exporting treatment plans and images and provides a simplified pre-treatment QA process by eliminating additional QA steps associated with manual data entry or incomplete data import.

Prescribe treatment workspace

Eclipse is specifically designed to help you get the most from your machine, so you can give the most to your patients. The electronic RT prescription is linked directly to the plan in the External beam planning workspace in Eclipse. Changes in the RT prescription trigger a transition to an unapproved plan status, resulting in the inability to treat the plan. This helps keep desired changes to the fractional dose from being overlooked. Dose is automatically scaled to match the change in prescription when a plan revision is created. Scheduled fractions are automatically updated in ARIA to reflect these changes. This also provides an audit history of any changes made and is password and user rights protected. In the pathway you can create the plan from your prescription or attach the prescription afterwards. The plan can only be approved if the prescription is approved.

Plan Integrity check

A plan signature is calculated at the time of plan approval. Upon opening the patient treatment plan at the machine treatment console, the system recalculates the signature to verify that important plan parameters remain the same as at the time of plan approval.

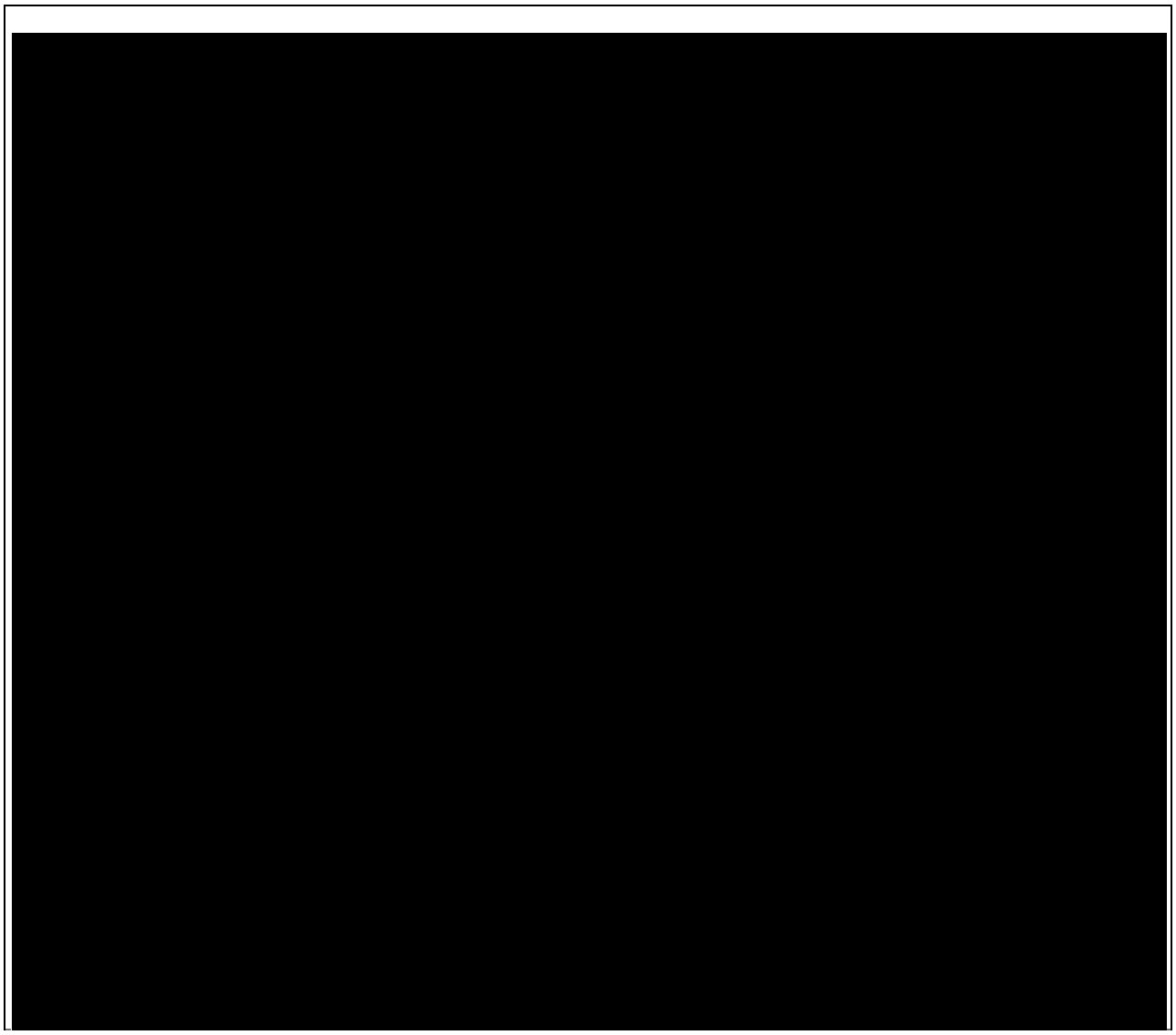
For third party systems, data transfer is managed via the DICOM Import and Export application. Connectivity to DICOM compliant SCU/SCP services are supported. This allows DICOM Query/Retrieve and DICOM Storage operations to 3rd party devices, like PACS (Picture Archiving and Communicating Systems) or a 3rd party TPS such as RayStation. It also provides import and export of non-DICOM image formats, like JPEG, TIFF, and BMP. The application supports image acquisition/import through external devices by scanning or frame grabbing.

4.1 8 Third party software:

The offered Products must include all third-party software needed to realise the full functionality of the system. The Contractor should confirm acceptance of this requirement and explicitly state which, if any, of the Board's existing software licenses will be retained.

(M) provide details

[redacted]



4.1.9 Retention of Data

The offered product must include the conversion and transfer of the all the data stored in the Board's existing DA system's database into the new offered system.

Contractor Response Yes - Eclipse and Velocity are fully compliant with this request. All the Board's existing data will be maintained as part of the ARIA/Eclipse upgrade included with this tender.	(M)

4.1.10 Continuity of Service

It is essential that the Board continues to provide a clinical service to its patients, even during the installation and implementation of the offered Products. The Contractor must explain how the offered Products will be installed and implemented without interruption of the Board's clinical service. A full and detailed plan for the installation and implementation of the offered Products must be presented and be acceptable to the Board.

(M) confirmation required

Yes – Eclipse and Velocity are fully compliant with this request.

To avoid interruption of the clinical service, the servers will be delivered and installed/prepared, ready for a weekend clinical migration upgrade of the existing ARIA system. The "pre-production" servers can be used for testing and training before the clinical upgrade event.

During the connection of the linacs we recommend offline mode to enable patient treatments to continue without interruption.

Please refer to the support document ***Edinburgh Implementation Plan.pdf*** for additional details.

4.1.11 Technical information

Copies of full technical documentation must be provided for all components of the TPS hardware, software and any third-party equipment, including operator's manuals, administrator's manuals and technical manuals describing the system configuration and operating procedures. Information must be provided to permit the user to import and export all patient data, treatment plans and associated files to peripheral computers / devices not specifically described elsewhere in this document. All system documentation including that for subsequent software revisions must be in English and clearly labelled with the version number and release date. The Contractor shall supply, any information required to permit the TPS to be interfaced to the department's radiotherapy information system, record and verify network and associated radiotherapy treatment delivery systems, where such information may be released to a third party. Where specific items of software or hardware are required to implement these interfaces, these items must be included in the tender offer. A detailed acceptance protocol covering both supplier and customer aspects must be provided.

(M) confirmation required

[redacted]

[redacted]

4.1.12 Additional fees

The offered Products should be free from any additional fees or software subscriptions that are required for the use of the Products. Furthermore, the Board should not be required to purchase a service contract in order to have full use of the offered Products.

(M) confirmation required Fully complies

4.1.13 Minimum Requirements for Training

In order to comply with statutory requirements, it is essential that staff across all disciplines are trained in the use of the new TPS (including system operation, commissioning, system administration / configuration, physics support, imaging, maintenance/repair, quality assurance and clinical implementation).

Training will be required for a core group of multi-disciplinary staff and this will be dependent on the equipment / software which is supplied to the Health Boards. The number of days training required will also be dependent on the level of integration that is required for new equipment being installed within the Health Boards.

All training offered must be identified. Details must include which staff group the training is for and the period of time on site. There must be no additional costs for any core training provided off site. Optional training courses, whether on or off site, must be described and costs identified. Contractors must provide information on their recommendations for training of the various multi-disciplinary groups on the basis of discussions with Health Board representatives.

(M) confirmation required

The Varian team in the UK are proud of the incredible partnership they have had with the team in Edinburgh for many years. The clinical team have been using ARIA and Eclipse extensively, for some time. Therefore, additional training and implementation will only be required for new features offered as part of the tender and will have no impact or disruption to the clinical service.

The upgrade required to the existing licenses to ARIA and Eclipse Version 16.1 does not change any existing functionality or workflows that have been previously implemented by the clinical team.

The training updates we provide can be flexible to users and enable all board staff to engage in this training based on their own needs and availability with the use of VarianThink, our new online learning and training platform. In addition to this, a bespoke single preliminary training and support plan has been created.

This training and support plan also incorporates support for process optimization and redesign, and adoption of key features that would maximize the benefit realised by the platform over the life of the contract.

Should we be the successful bidder, this 'Training and Support Plan' would then be adjusted and finalised in line with the solutions chosen and the Board's preferences and a final, executable training and support plan would be defined.

The Varian Clinical Solutions team have discussed the key objectives and current OIS and TPS workflow of the radiotherapy department at NHS Lothian, to ensure that we can provide suitable recommendations and support for the implementation of new offered features as part of this tender at NHS Lothian.

The integration of Varian software and hardware enables safe and effective provision of patient care in this setting, aggregating patient data into a single, organized, oncology-specific medical chart. It also minimizes the risk of human error and expedites the transition from plan creation to treatment delivery. Optimal system design and configuration to reflect your hospital goals, KPIs and specific workflows is the key to harnessing the full benefit of your Varian platform and to realising rapid and thorough adoption.

Please see the support document ***NHS Lothian Training Requirements.pdf*** for a breakdown of all the options available.

4.1.14 Minimum Requirements for Equipment Warranty & Support Services

A warranty, commencing from the date of acceptance for the TPS will be provided. The period of the warranty will be twenty-four (24) calendar months from Acceptance. This warrants all modules, components and parts such that any failure during the period of the warranty would be replaced at no extra cost to the Health Board. During the warranty period, the Contractor will rectify faults, as detailed in the Agreement, within the timescales laid out in the Agreement. The Contractor's Engineer will attend on site, at no cost to the Health Board, if required to meet these conditions.

Remote access computer support must be provided to facilitate fault investigation and resolution and should be stated. Details should be provided of how these facilities are provided including confirmation

of NHS network connectivity agreements.

Servers should be provided with a minimum 5-year manufacturer's warranty and clients with a minimum 3-year manufacturer's warranty unless other arrangements for support are offered.

Following expiry of the warranty period, the Health Board's staff or other third parties may undertake the service and repair of the TPS hardware. Any parts of the equipment, which must not be calibrated, serviced or repaired by Health Board staff or third parties must be stated.

(M) confirmation required

Fully complies

As required, a warranty will be provided for a period of 24 months from Acceptance and any attendance on site will not attract additional cost to the Board. Additionally, planned preventative maintenance inspections will be undertaken as per manufacturer's recommendations during the warranty period at no additional charge to the Board and arranged at mutually acceptable dates. Post warranty period for the remainder of the life of the system (defined as 5 years), Technical and Applications telephone support will be provided 8:00am to 6:00pm Monday to Friday, excluding public holidays, for the period of the warranty.

As a complex software product, bugs will exist. All reported bugs shall be investigated, and a determination made of what action to be taken. For the warranty period all updates are provided free of charge and also post warranty if an appropriate agreement is taken. Irrespective of contract status all software updates flagged as mandatory by Varian will be provided free of charge for the defined lifetime of the product.

Help Desk Technical (HTST) Support
During the warranty period, Varian's help desk specialists will provide technical support for the covered Equipment. Support is available by telephone, through the MyVarian portal and e-mail during Varian's standard hours.

Remote Support
During the warranty period, Varian will provide remote support during Varian's standard hours for service of a defect or an error that cannot be resolved by telephone or e-mail.

Computer Coverage
During the warranty period, in case of hardware failure of the computer server, Varian will repair or replace the hardware including the cost of shipping, if required. This coverage only includes failure sustained through normal intended usage of the product during contract period. It excludes hardware failure due to abuse, misuse, improper installation, negligence, accidental mishandling or acts of nature. Coverage is limited to a maximum period of 3 years from the time of original installation of the computer server product.

4.2 Evaluated items

4.2.1 Hardware, Software & Interfacing

The TPS equipment should be capable of interfacing with existing departmental solutions for data storage and distribution. The Contractor should be able to demonstrate such integration at the request of the Health Board, by providing details of a reference site with the same equipment, or by a realistic demonstration of the equipment in use.

Please provide confirmation and indicate how this will be demonstrated. Yes – Eclipse and Velocity are fully compliant with this request. The offered solution meets this requirement, as ARIA and Eclipse act as a unified database. Additionally, the offered solution is an upgrade/migration of the current software, allowing for a smooth integration between the current environment and the proposed future environment. The infrastructure where the system resides is specifically designed and sized for the customer's existing licences plus the additional licences offered as part of the solution. Computing power and storage are designed to host the existing data plus the estimated growth for the next 5 years plus an additional 10% for eventual emergency growth. The following sites have been listed below as reference sites with the same equipment as Edinburgh Cancer Centre (ECC), Western General Hospital, Edinburgh • Altnagelvin Area Hospital, North West Cancer Centre, Londonderry • The Beatson West of Scotland Cancer Centre, Gartnavel General Hospital, Glasgow • Clatterbridge Cancer Centre, Liverpool • Hull University Teaching Hospitals NHS Trust, Castle Hill Hospital, Hull • Royal Surrey County Hospital, Guildford • University College London Hospitals NHS Foundation Trust, London **Unified database** In a Varian environment, Eclipse and ARIA® oncology information system share a unified database, so any patient or plan present within ARIA will be automatically available within Eclipse without any user interaction. This connection is maintained with the Varian linear accelerators, so all treatment and imaging records are also stored within the same unified framework. Through this integration with the TPS, OIS and Varian Linac, workflows are smooth, efficient, seamless and above all safe. This is important to eliminate transcription and redundant data entry, which is time dependent. This also removes the human factor of importing/exporting treatment plans and images and provides a simplified pre-treatment QA process by eliminating additional QA steps associated with manual data entry or incomplete data import. **Prescribe treatment workspace** Eclipse is specifically designed to help you get the most from your machine, so you can give the most to your patients. The electronic RT prescription is linked directly to the plan in the External beam planning workspace in Eclipse. Changes in the RT prescription trigger a transition to an	(E)

unapproved plan status, resulting in the inability to treat the plan. This helps keep desired changes to the fractional dose from being overlooked. Dose is automatically scaled to match the change in prescription when a plan revision is created. Scheduled fractions are automatically updated in ARIA to reflect these changes. This also provides an audit history of any changes made.	

Details of possible network configurations should be provided, e.g. thick client, thin client, hybrid etc. Restrictions on co-hosting other radiotherapy related software on these systems should be declared. Costings should be provided for any network solutions that the contractor feels NHS Lothian may wish to consider.

Please provide details. No other RT related software, other than Varian approved SW, should reside on the offered solution. All clients will be thin client using Citrix agents.	(E)

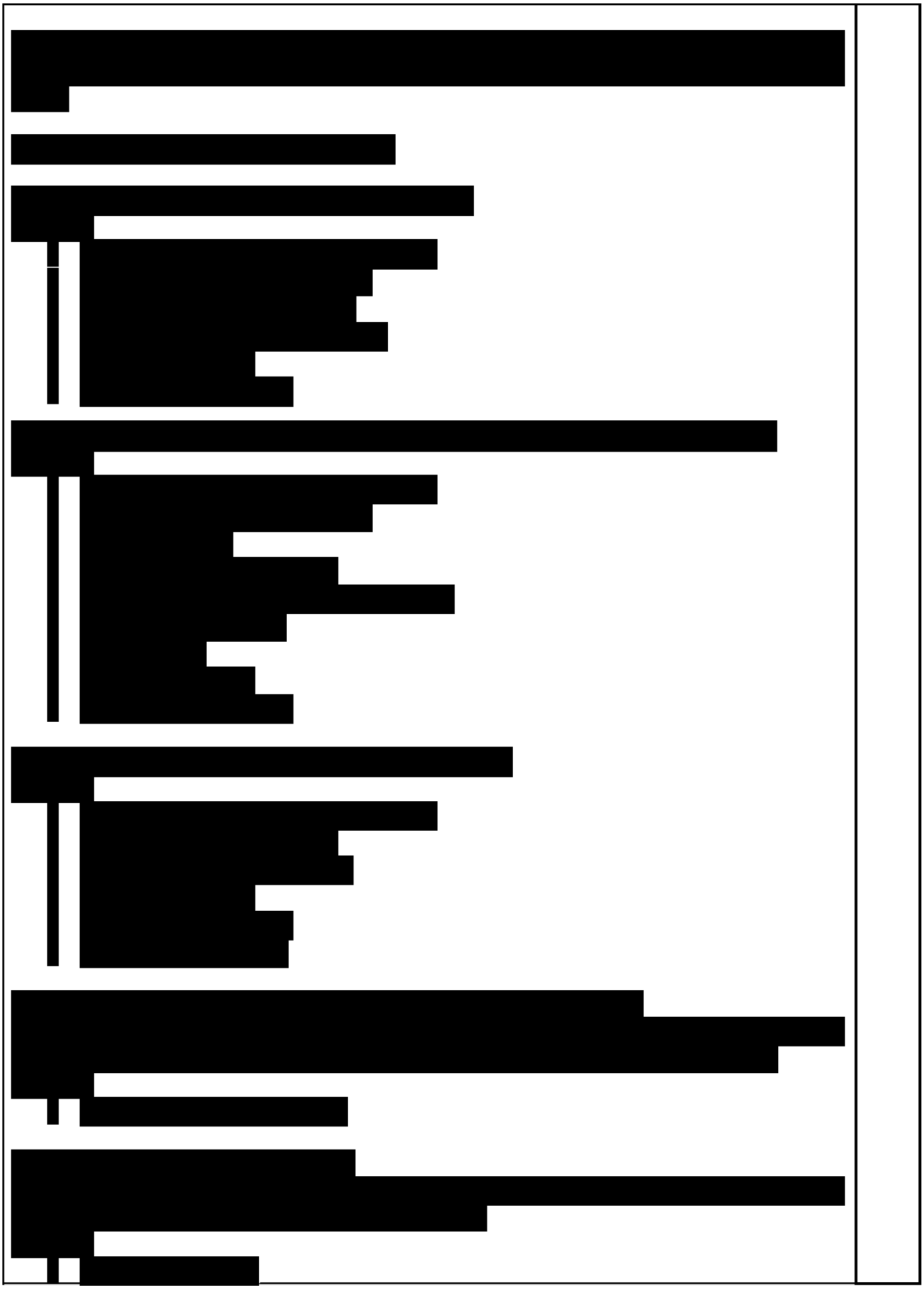
Details of how software and related data are backed up and / or archived and available failover solutions should be provided. If additional equipment is required for these functions, then this should be clearly identified in the tender submission.

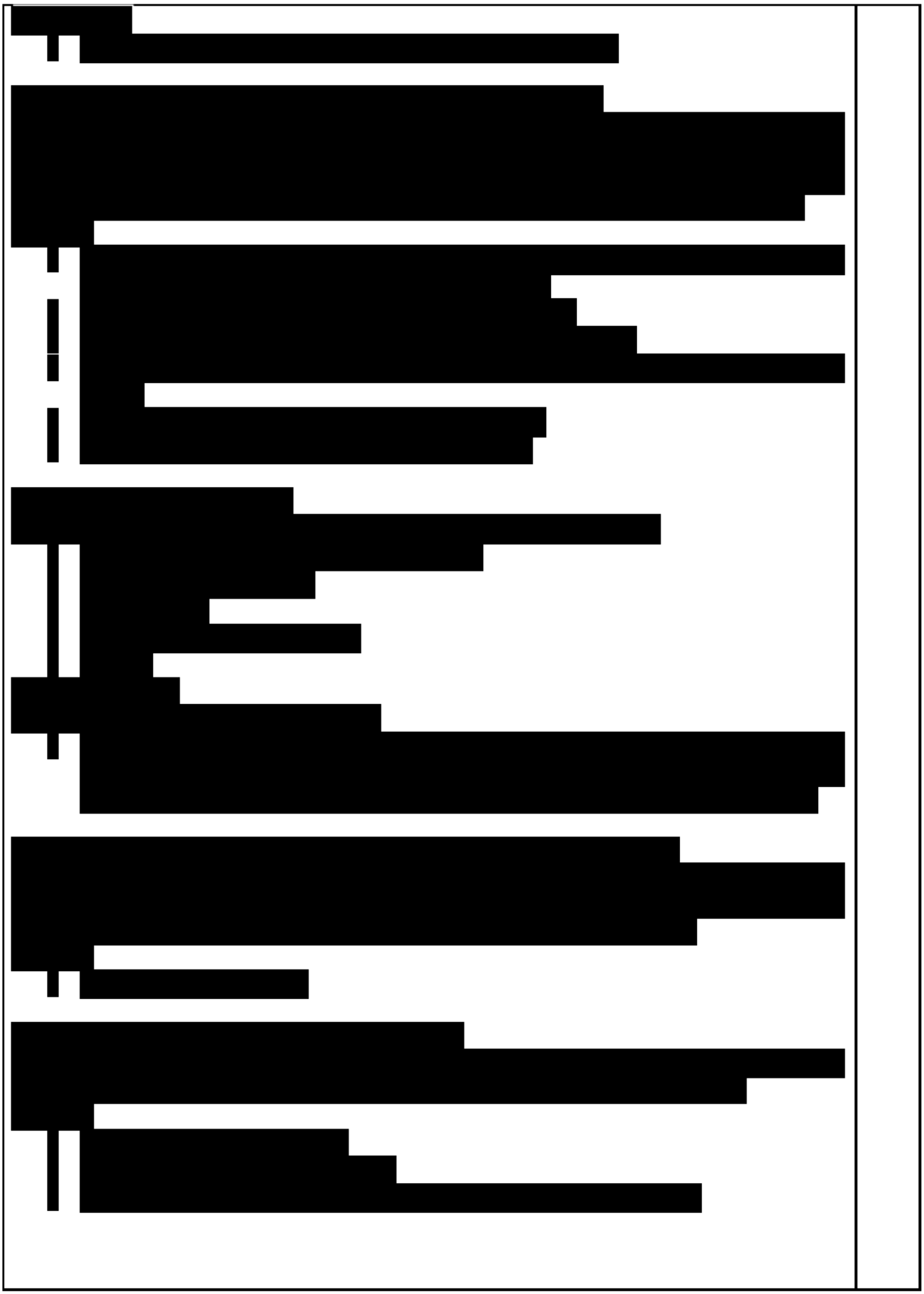
Guidance on the storage space required for a database(s) containing approximately 10 years of data with approximately 3,500 patients per year. This will increase over time with increased use of 4D scanning. There is a preference to keep all patients on the same database. That is, to avoid archiving.

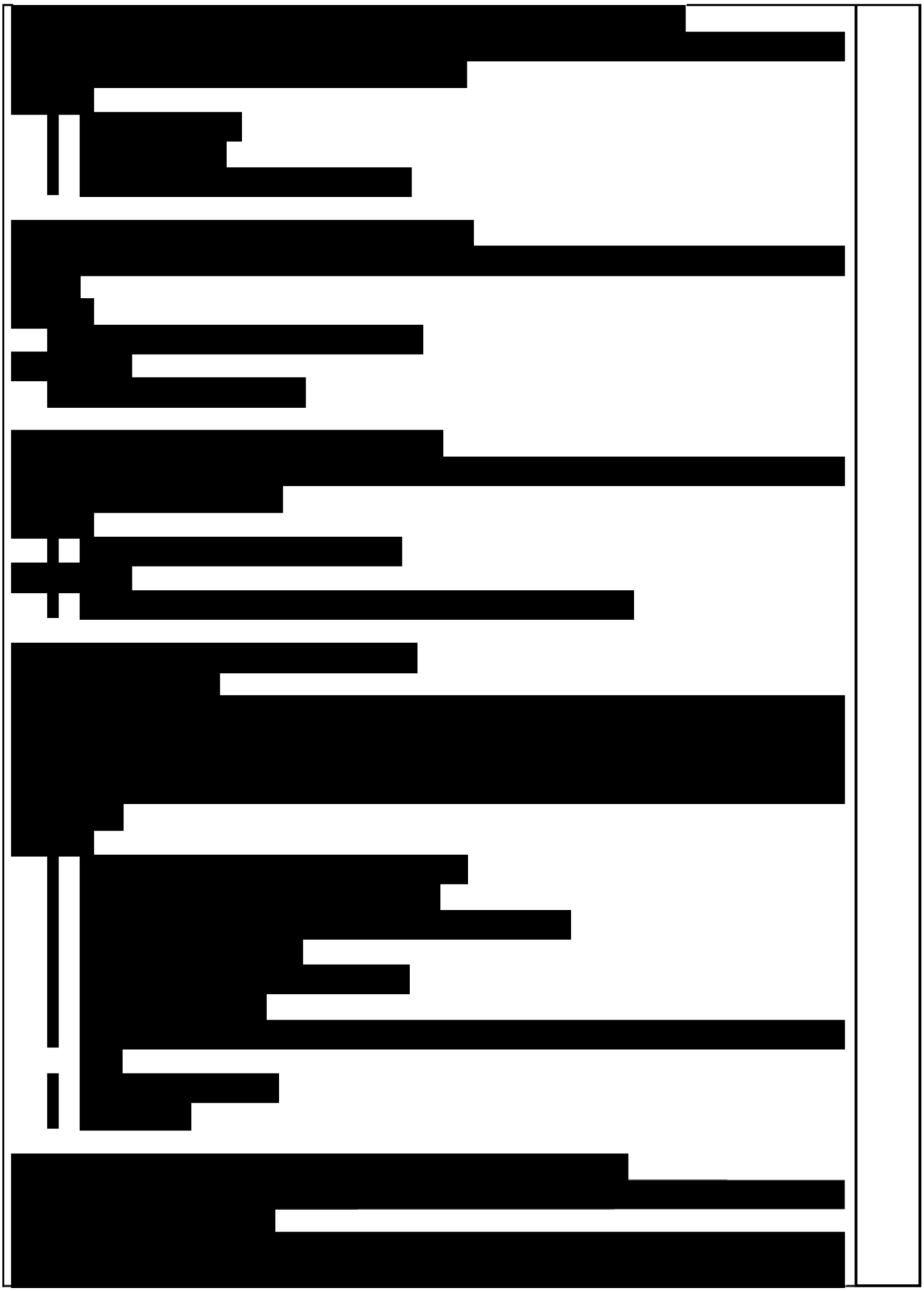
Please provide details. Back-up is provided using a Dell R740xd server with 96TB of RAW storage capacity, this uses Nakivo backup and replication to take VMware based backups from the VxRail cluster. Back-ups on VxRail do not impact virtual machine performance. Retention of back-ups depends on data change rates but Nakivo does use deduplication technology for efficient backup storage. A stretched VxRail Cluster requires a third site to host a VSAN witness. The witness serves as a tiebreaker when a decision must be made regarding availability of datastore components when the network connection between the two sites is lost. In this case, the witness host typically forms a vSAN cluster with the preferred site. But if the preferred site becomes isolated from the secondary site and the witness, the witness host forms a cluster using the secondary site. When the preferred site is online again, data is resynchronized to ensure that both sites have the latest copies of all data. The witness site will also be where the backups are stored for the VxRail cluster, as well as vCenter and monitoring systems.	(E)

It is a requirement that the most recent version of any software described in the tender is delivered when the TPS is installed. There should be a clear identification of what software is included in the tender submission and that which is optional. All software modules and their functions should be identified and described in detail.

Please provide details. [redacted]	(E)

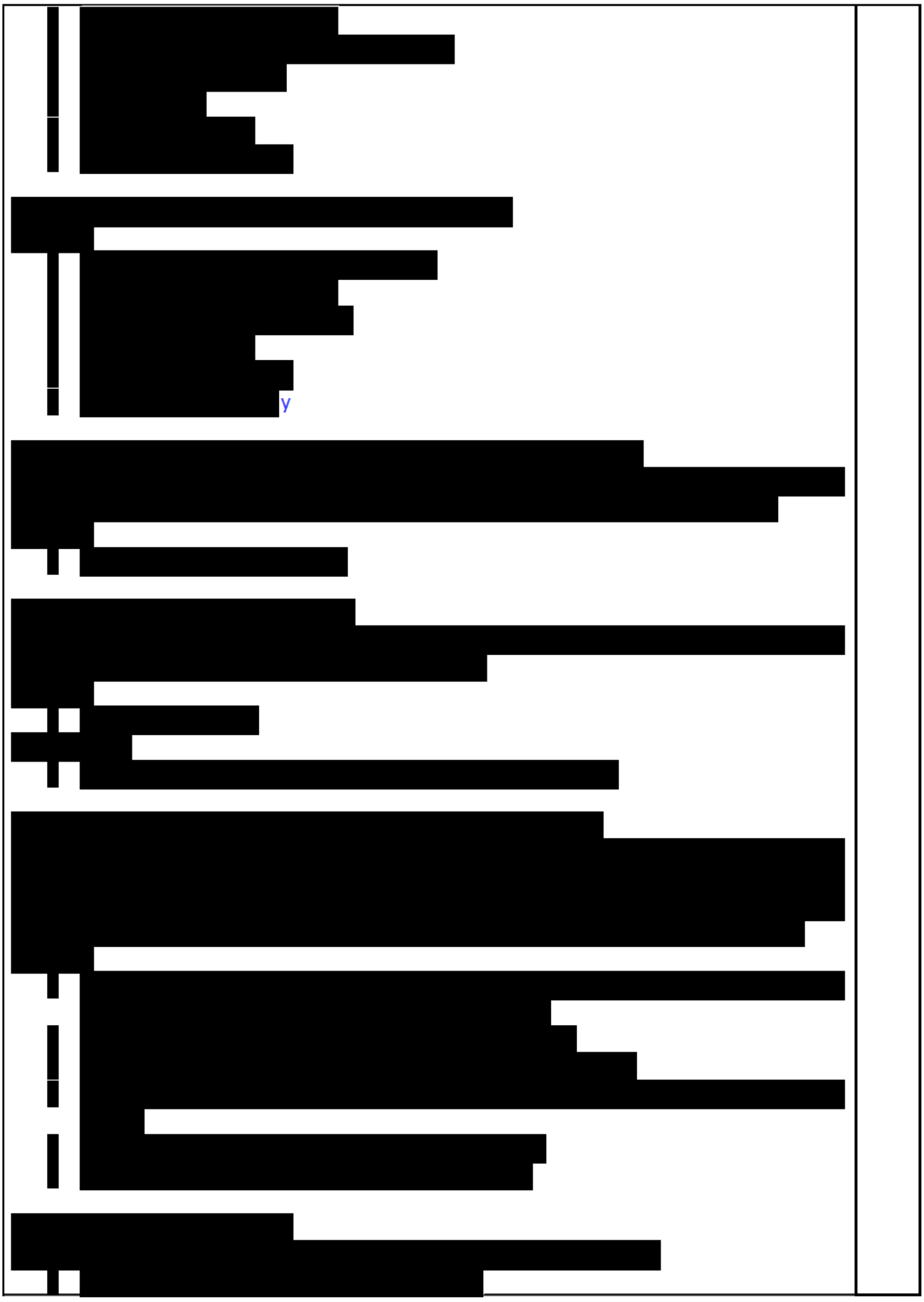


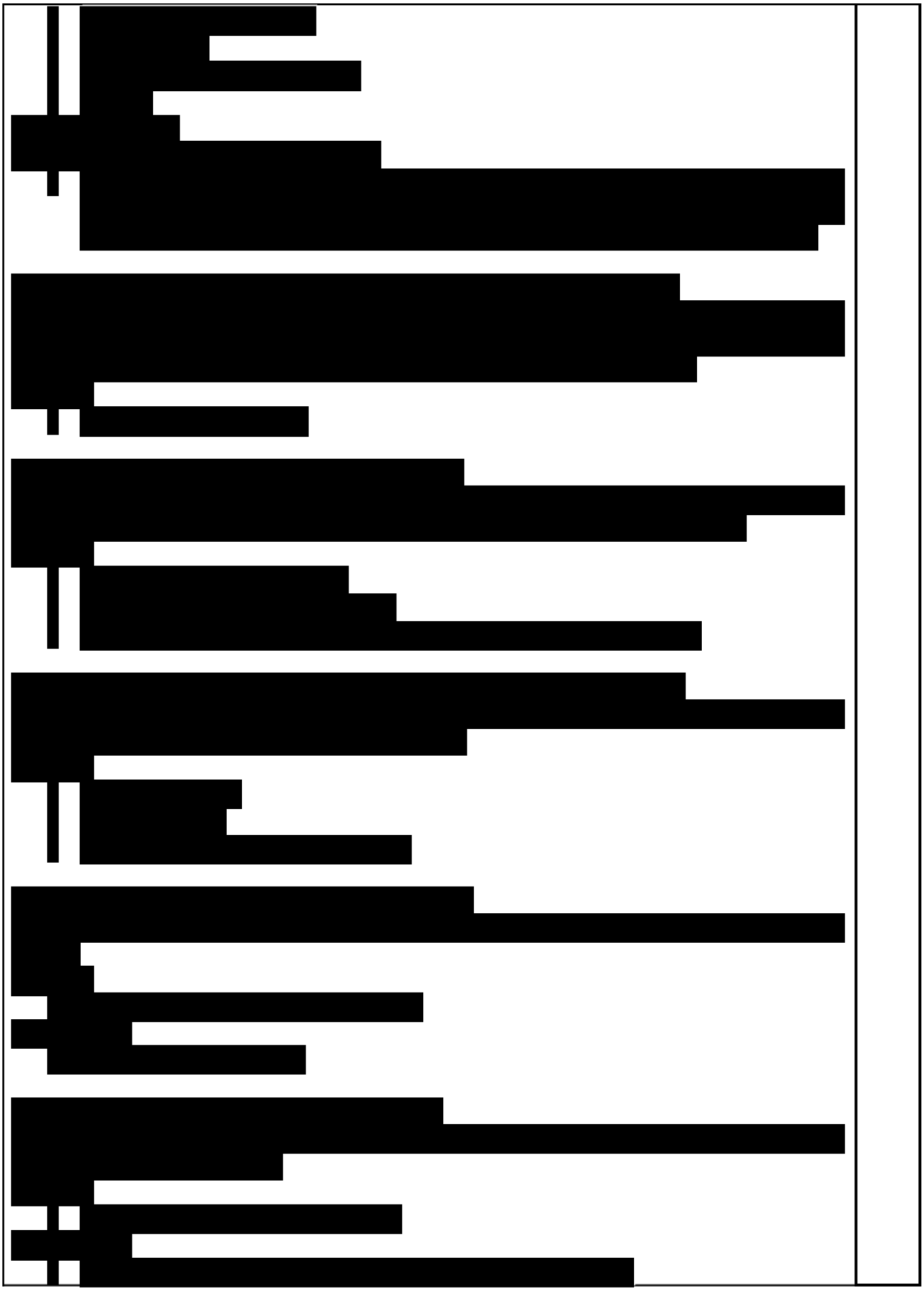


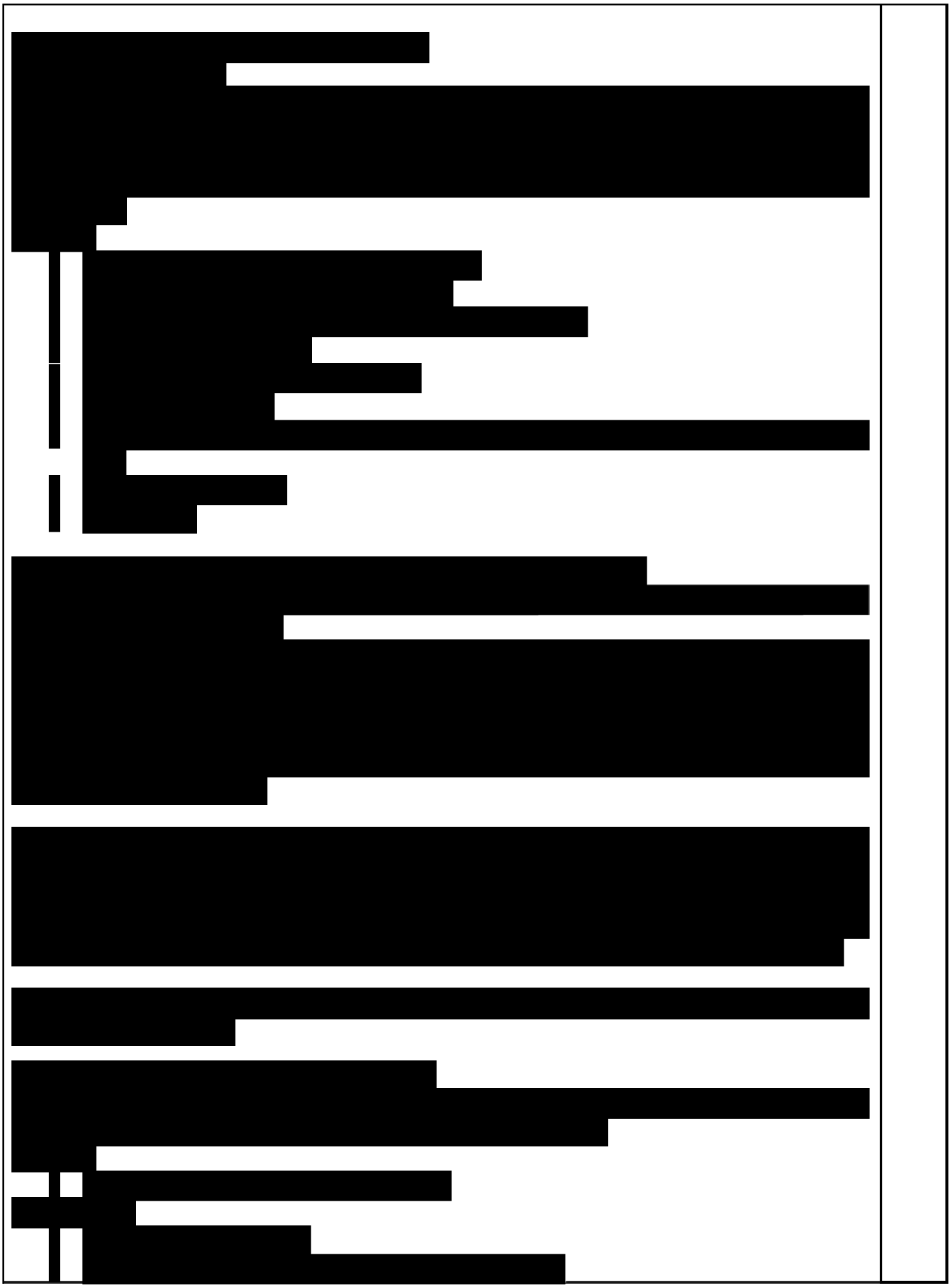


Details of the licencing structure, e.g. fixed, floating or site, should be provided for each software component.

Please provide details.	(E)
	







[redacted]	

The Board may require 2 networked duplex laser printers providing a complete printout of all relevant parameters of the plan, customisable by the user, dependent on the chosen solution.

Please provide details of suitable printers: [redacted]	(E)

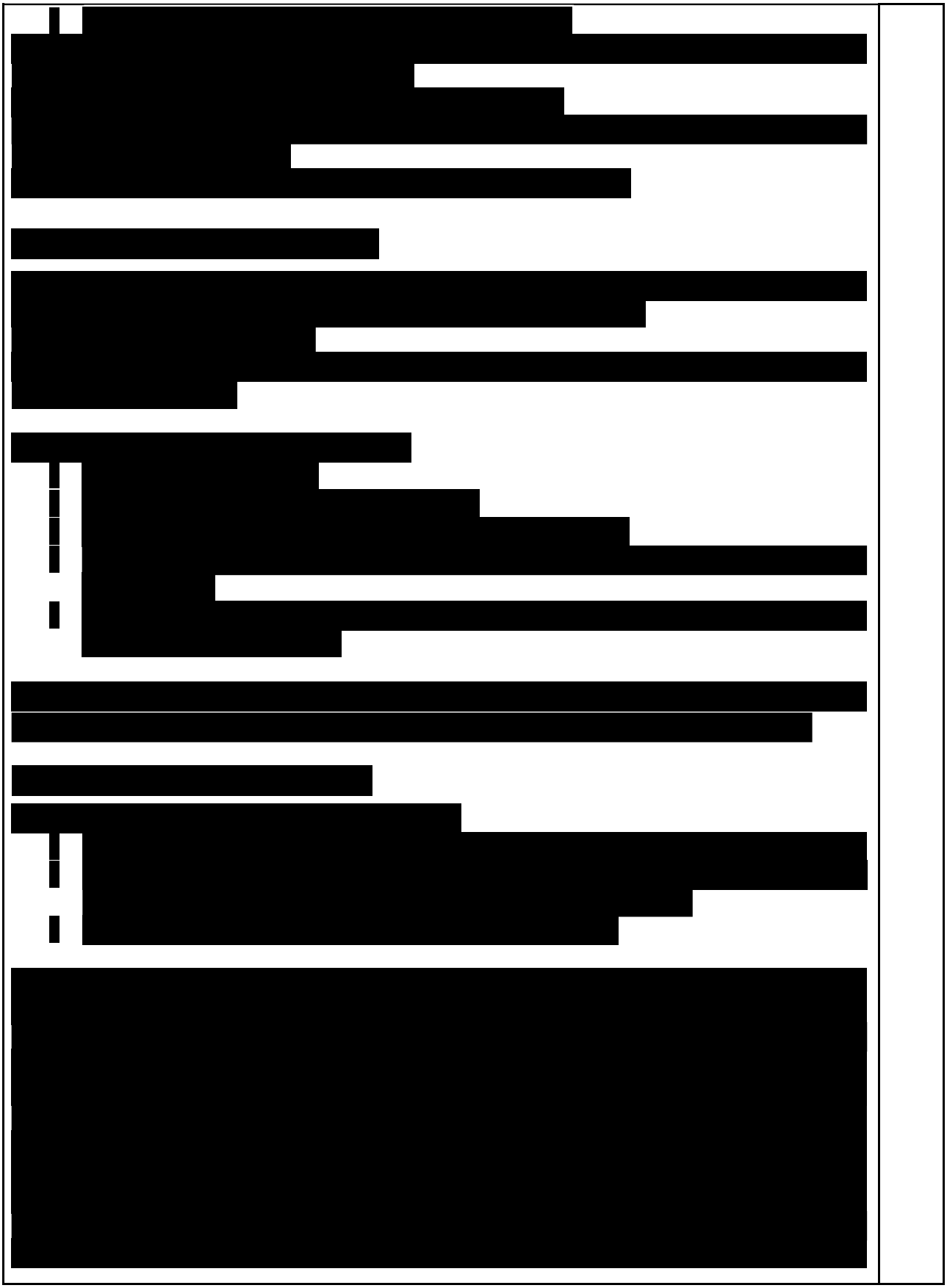
The TPS should be supplied with a system which is independent of the clinical database to allow for training, testing, development and commissioning of new software versions.

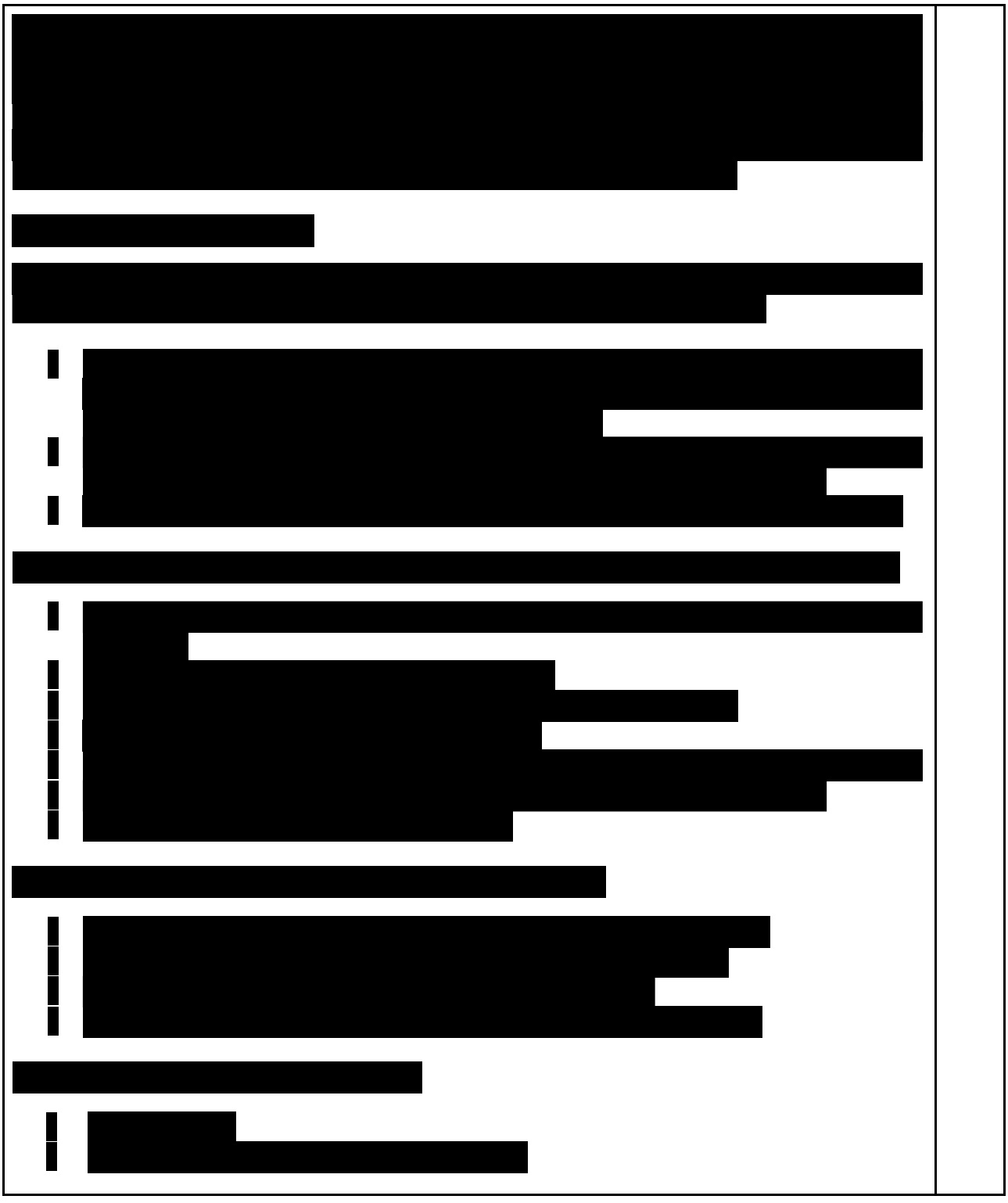
Please supply details of the system offered. Yes – Eclipse is fully compliant with this request. In order to avoid populating the clinical database with training cases, for configuration changes and upgrades, a T-Box will be provided to set up various training cases, using data originally from the clinical DB. It is possible to DICOM Export an entire patient's plan/image and treatment history set and then set this up in the T-Box as a new/anonymous patient. A T-Box can support up to 5 clients connected to create a 'classroom' environment. This can be provided in a physical or virtual environment. This will include test beam data for typical linacs supplied in the package,	(E)

with the energies identified in the Linac functional specification section, for the purposes of testing and training.	

Details should be given on support offered for the implementation of the TPS.

Please provide details:	(E)

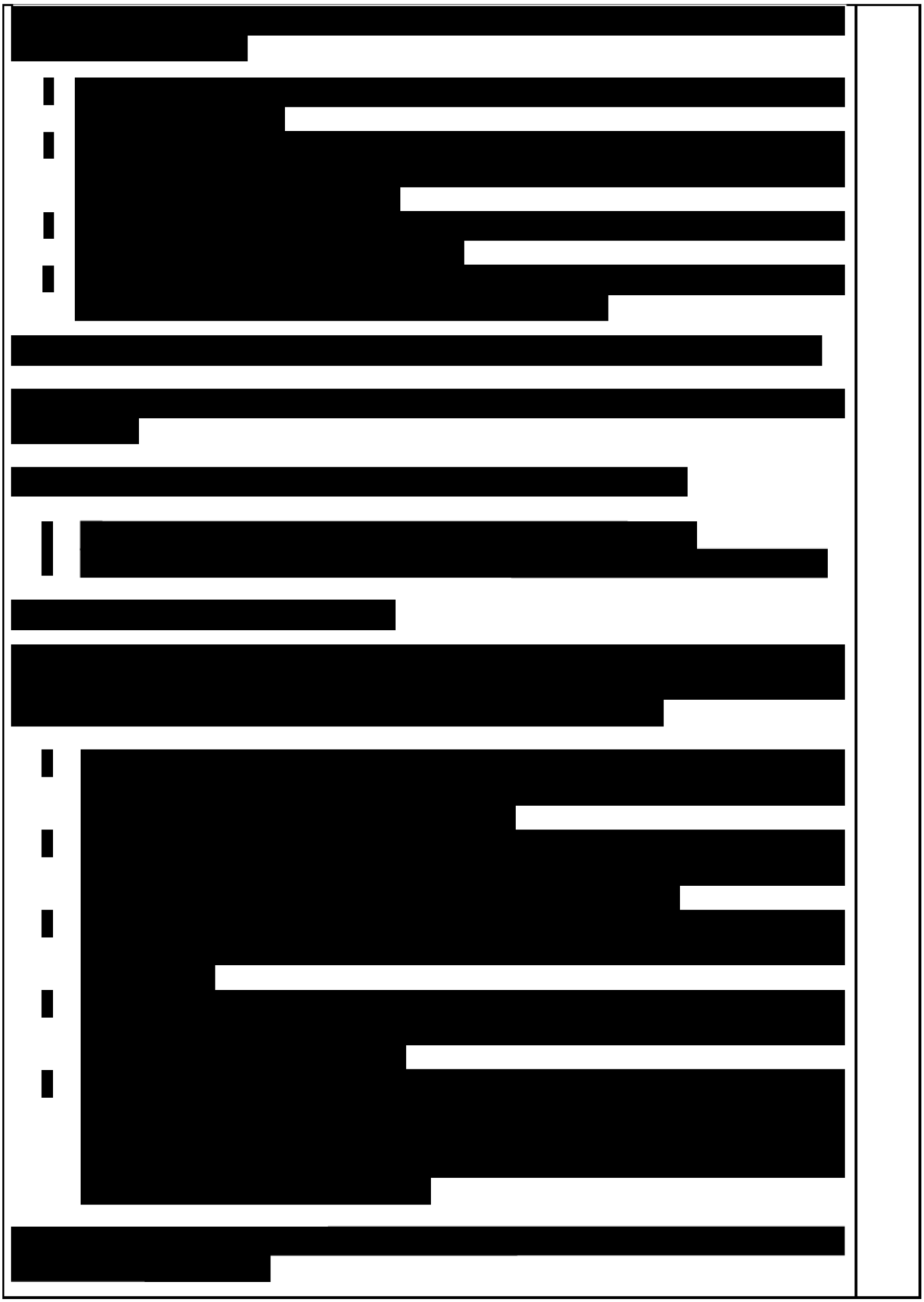




4.2.2 Data Input/Output & Handling

The TPS should be capable of accepting measured radiation beam data from current commercial beam data acquisition systems. Provide a list of interfaces already available and / or how the data must be formatted for transfer to the TPS. Please provide a full list of the required data for the beam models. Details of the modelling process including whether the data can be modelled in-house and a description of any software tools should be provided.

Contractor Response. [redacted]	(E)



The TPS should enable the user to specify coordinate systems, physical parameters and limits independently for each treatment machine. The IEC 60101 'Radiotherapy equipment – Coordinates, movements and scales' standard should be supported.

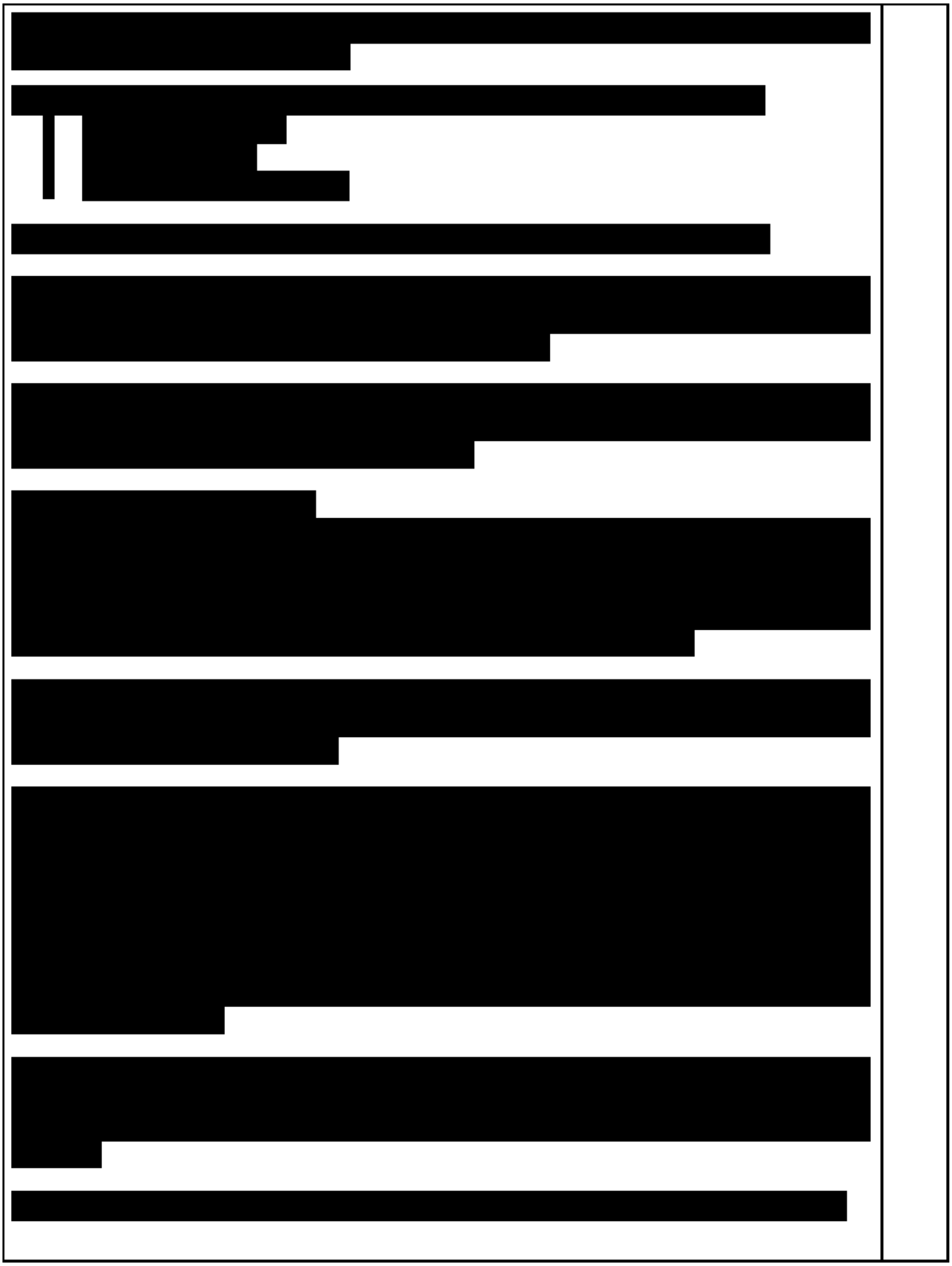
Contractor Response.	(E)
[redacted]	

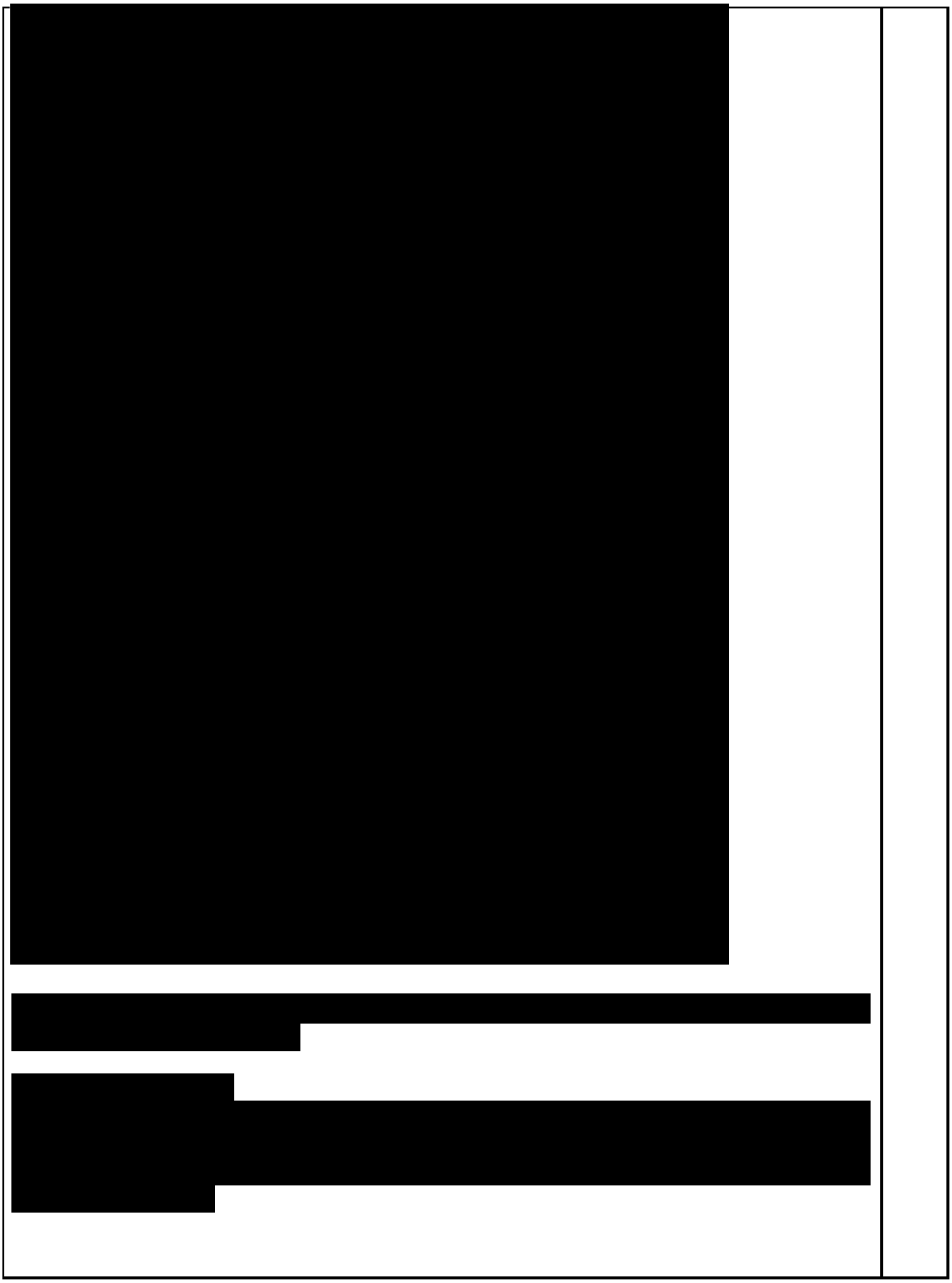
The TPS should be capable of modelling all currently available MLC devices including physical dimensions, inter- and intra-leaf leakage. A description of how the leaf tip and leaf edges are modelled should be provided.

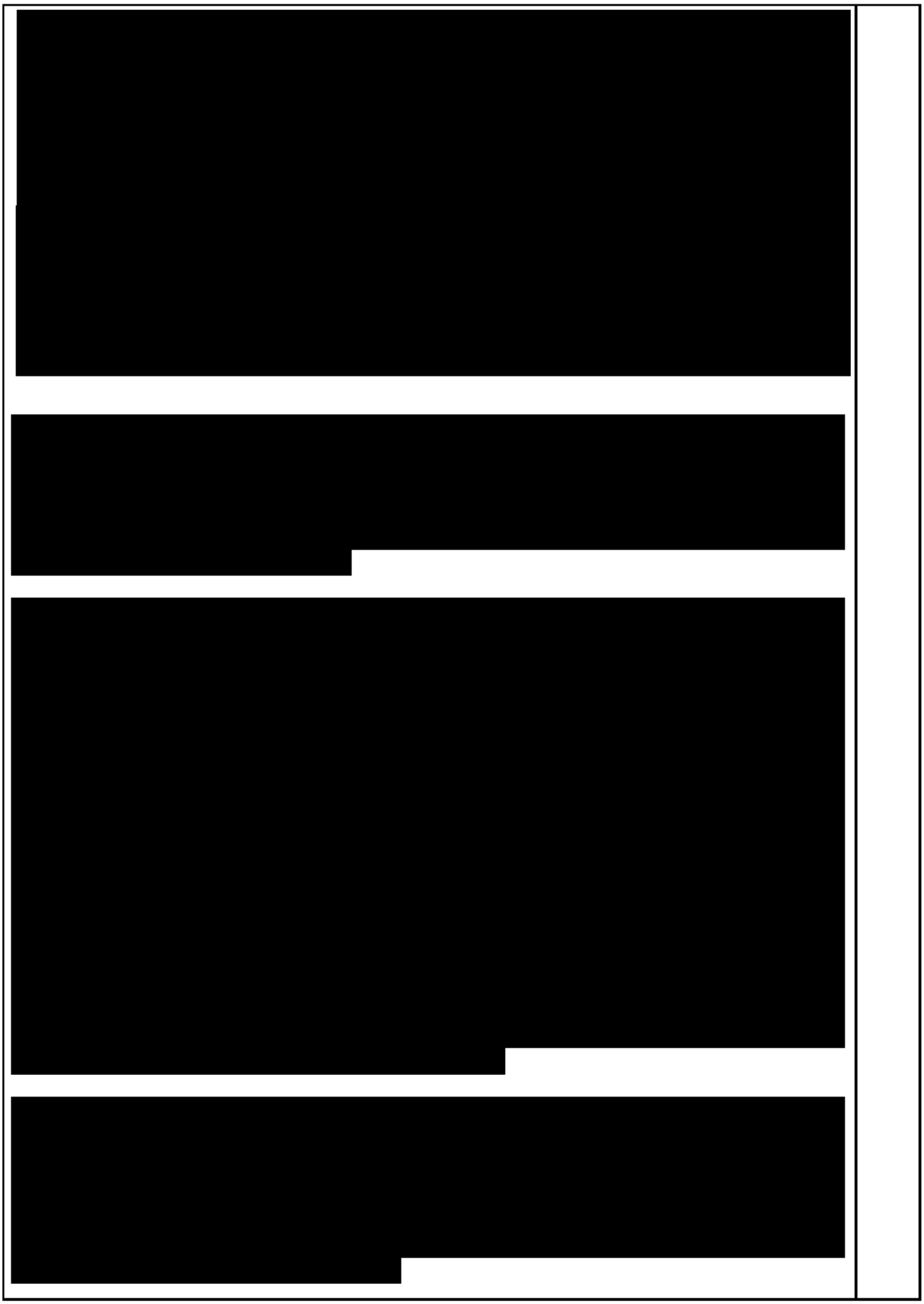
Contractor Response.	(E)
[redacted]	

The functionality must exist for a CT number to electron/mass density table to be provided for each interfaced CT scanner / CBCT device.

Contractor Response.	(E)
[redacted]	







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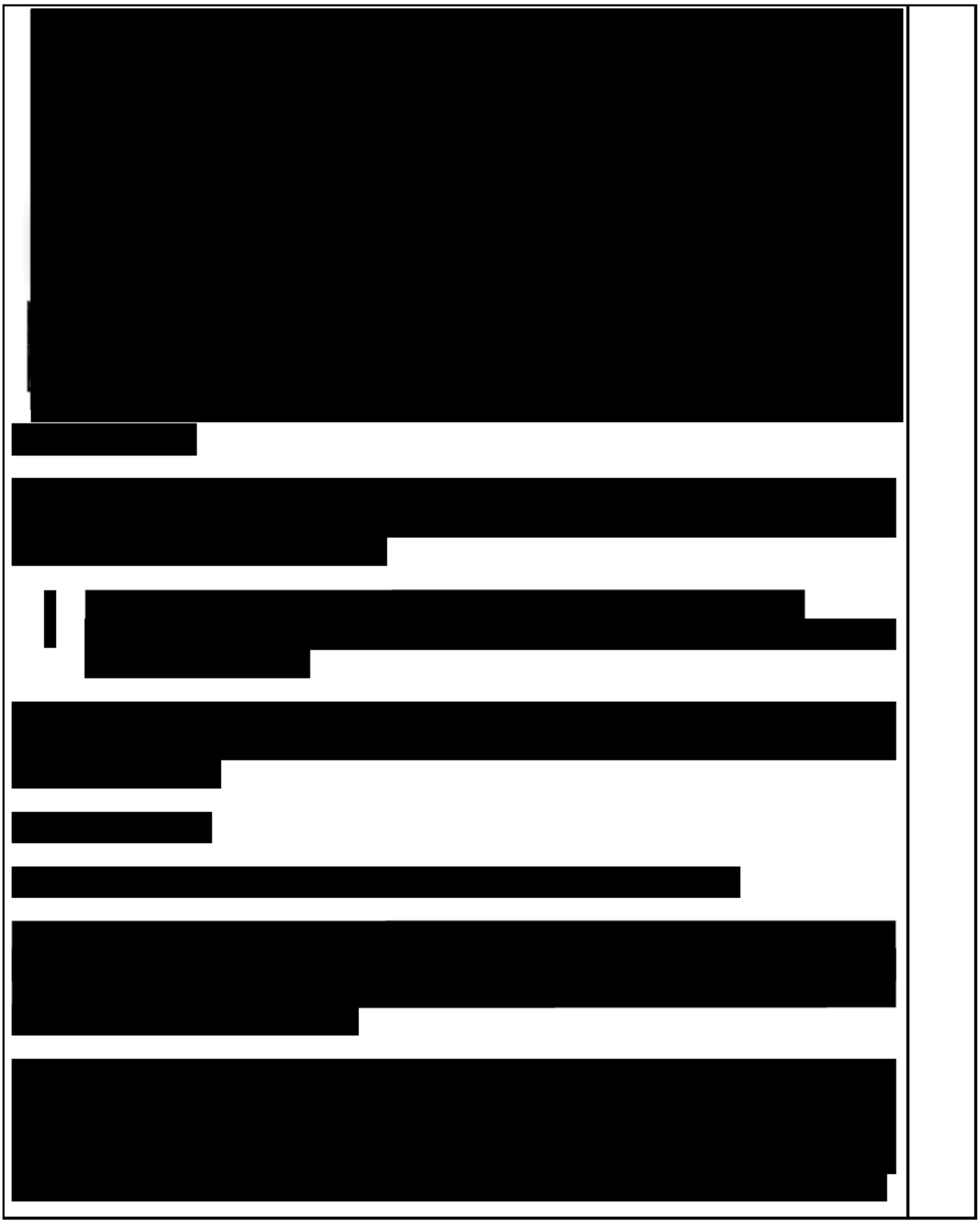
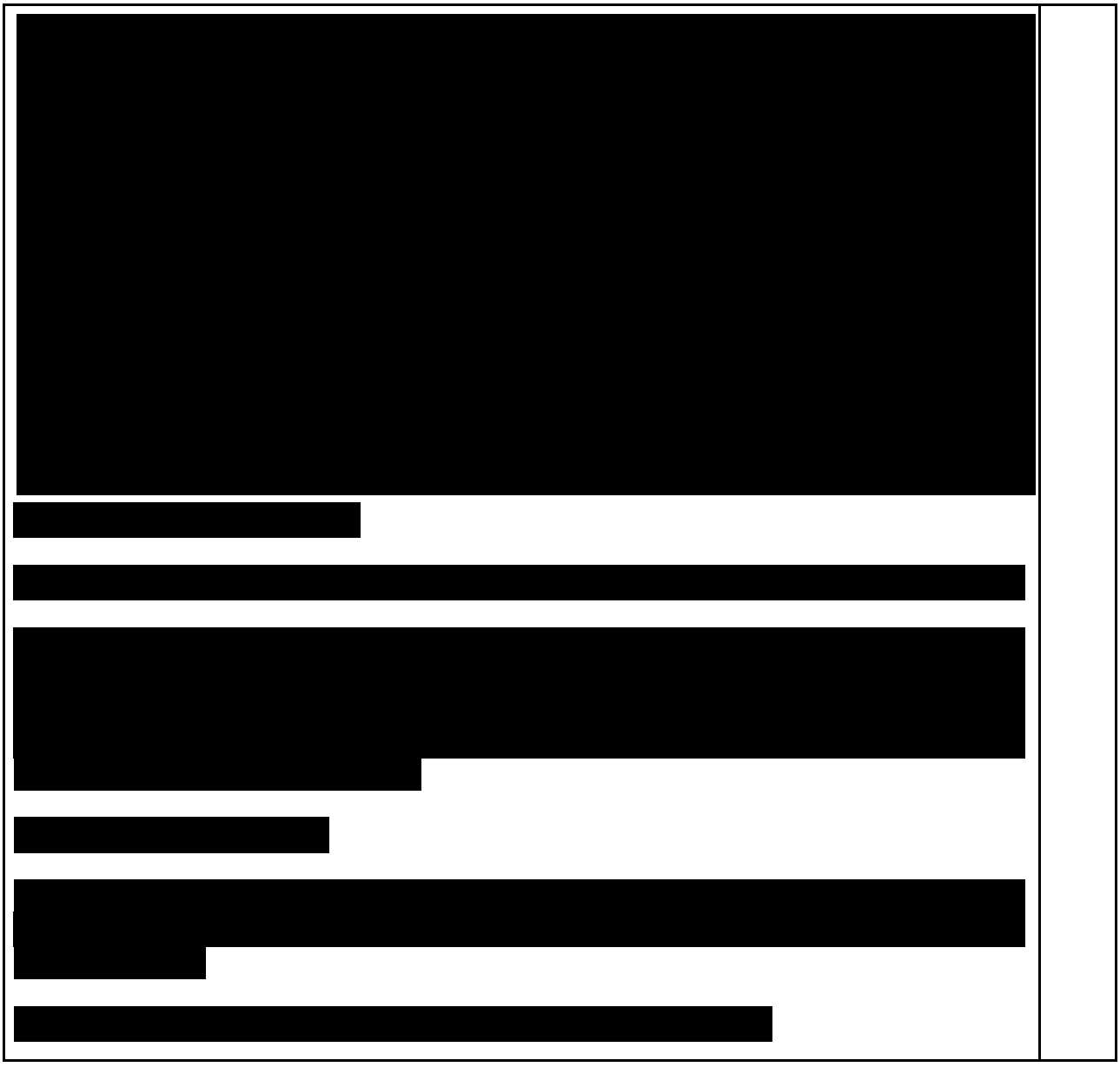


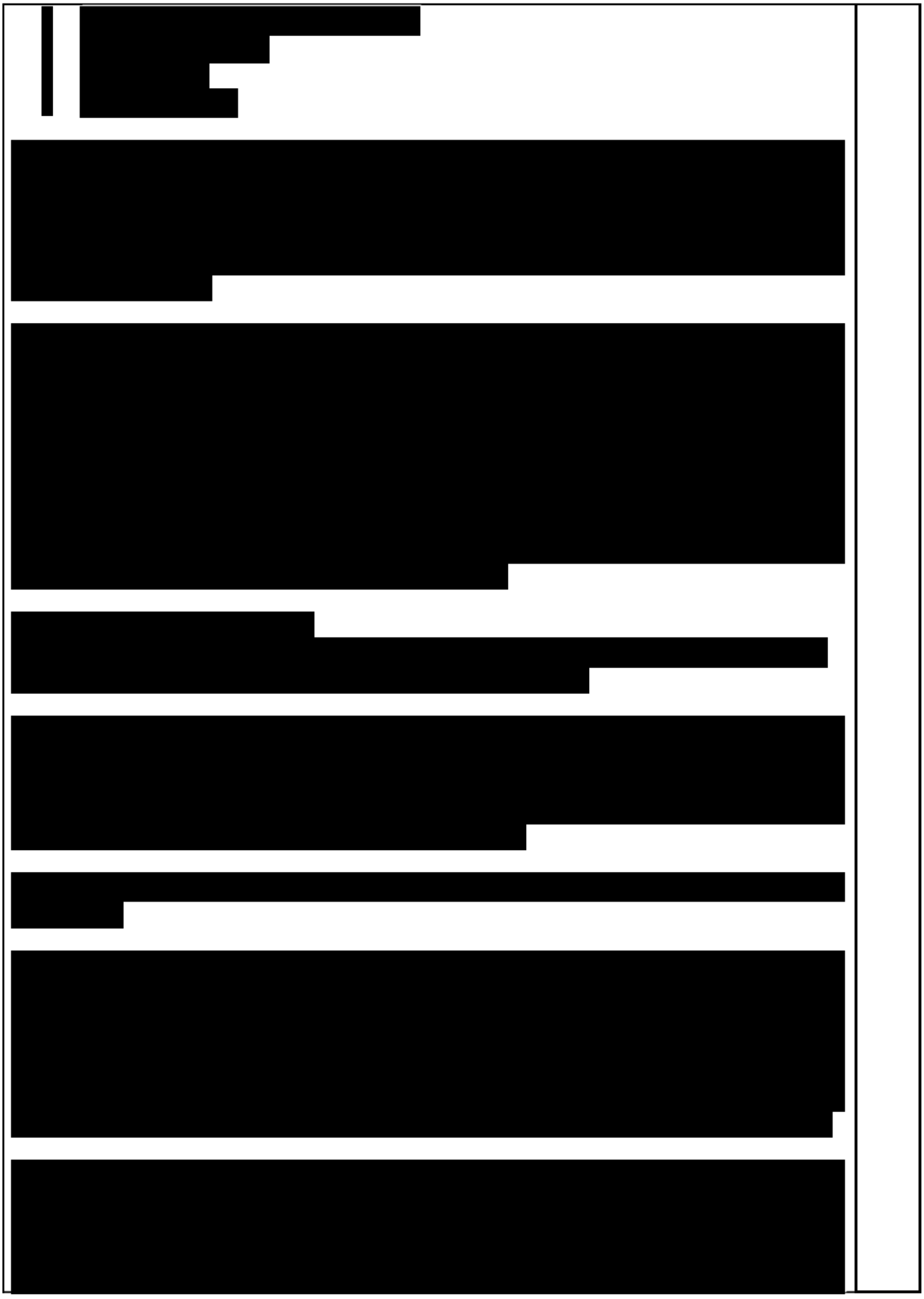


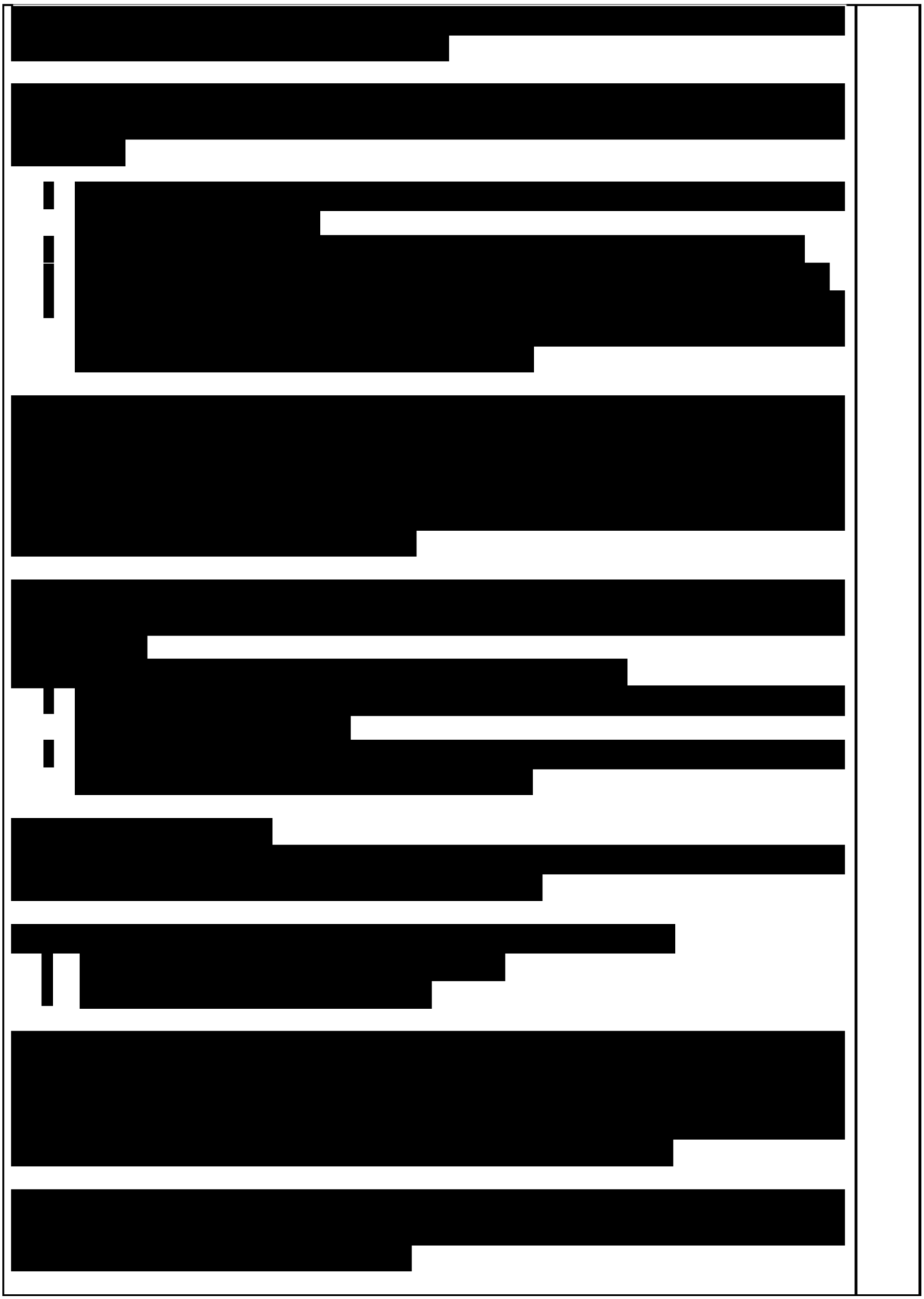
The TPS should be capable of

- receiving data in DICOM format and both importing and exporting CT Image, MR Image, PET Image, RT Structure, RT Plan, RT Image and RT Dose objects in standard DICOM format
- Accepting DICOM image data from any current CT, MR or PET scanner. List any known exception(s) and license requirements. Specify maximum number of slices supported in a single set.
- Accepting such DICOM data with minimal user interaction via a direct link from the image source or from a separate Storage Server.
- Accepting such DICOM data from portable media.
- Accepting image slice sets with different slice separations within the same set and be able to accurately perform all subsequent actions accurately on such an image set.

- Distinguishing between different image slice sets for the same patient acquired at a different time (e.g. re-treatment or multi-phase treatment). Specify maximum number of sets supported.
- Accepting and correctly coping with tilted scan planes
- Defining phantoms (e.g. water tank) for dosimetry verification.
- Verification plans must be able to be created from patient plans
- Exporting laser coordinates to moving laser systems on CT simulators

Contractor Response.	(E)



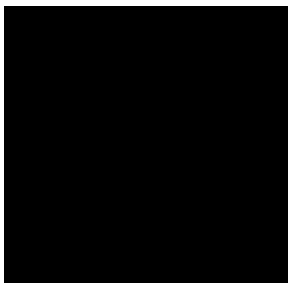


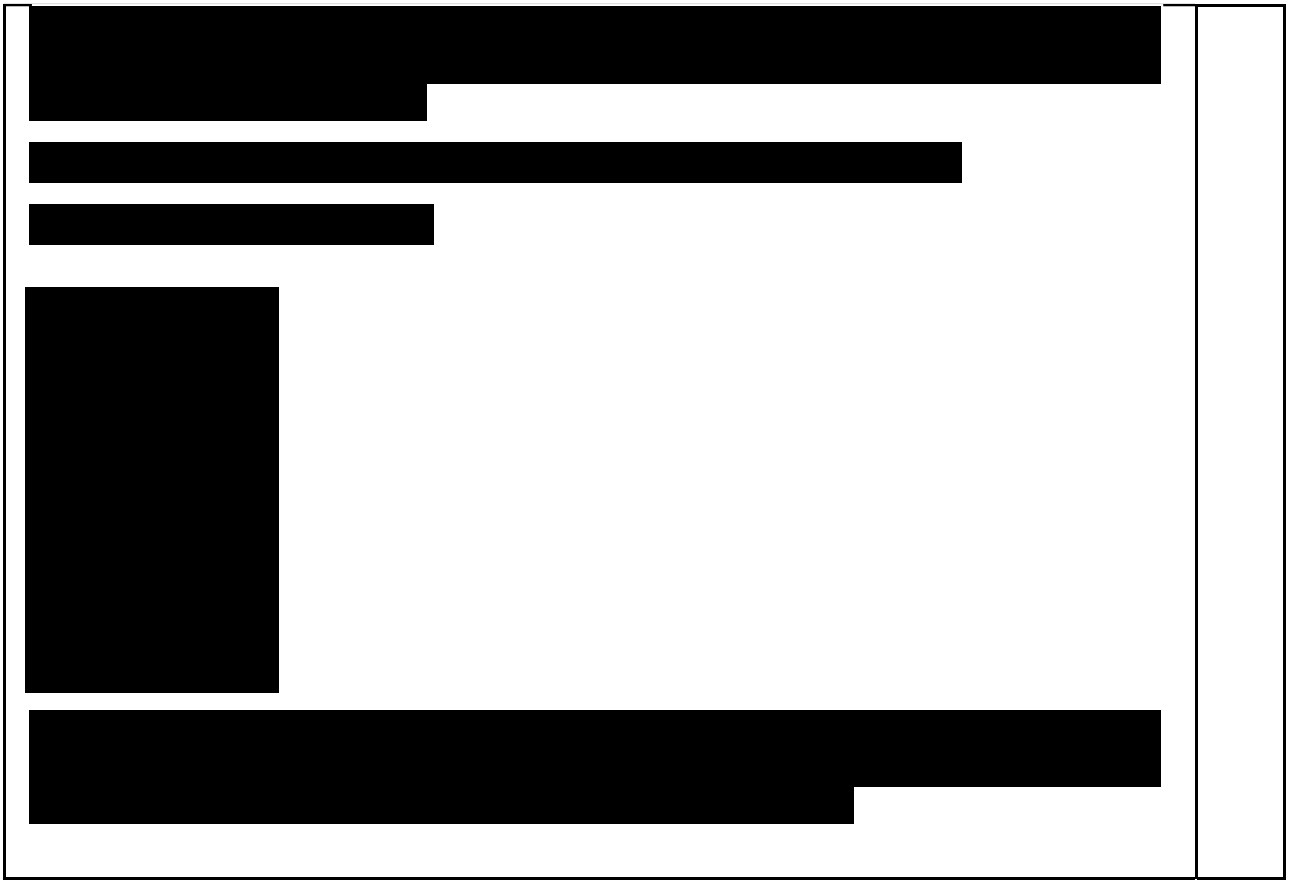
[redacted]

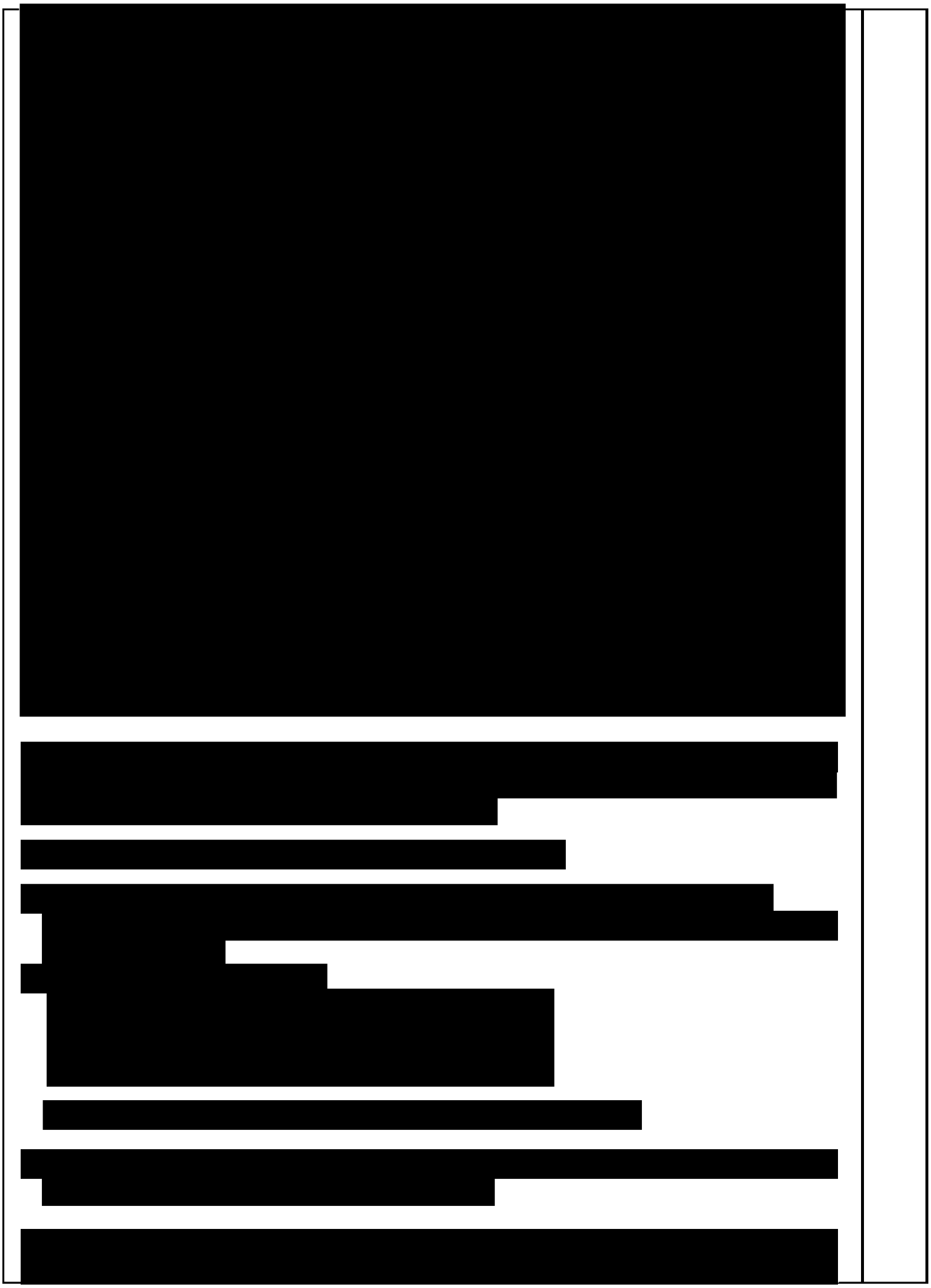
4.2.3 Image Handling

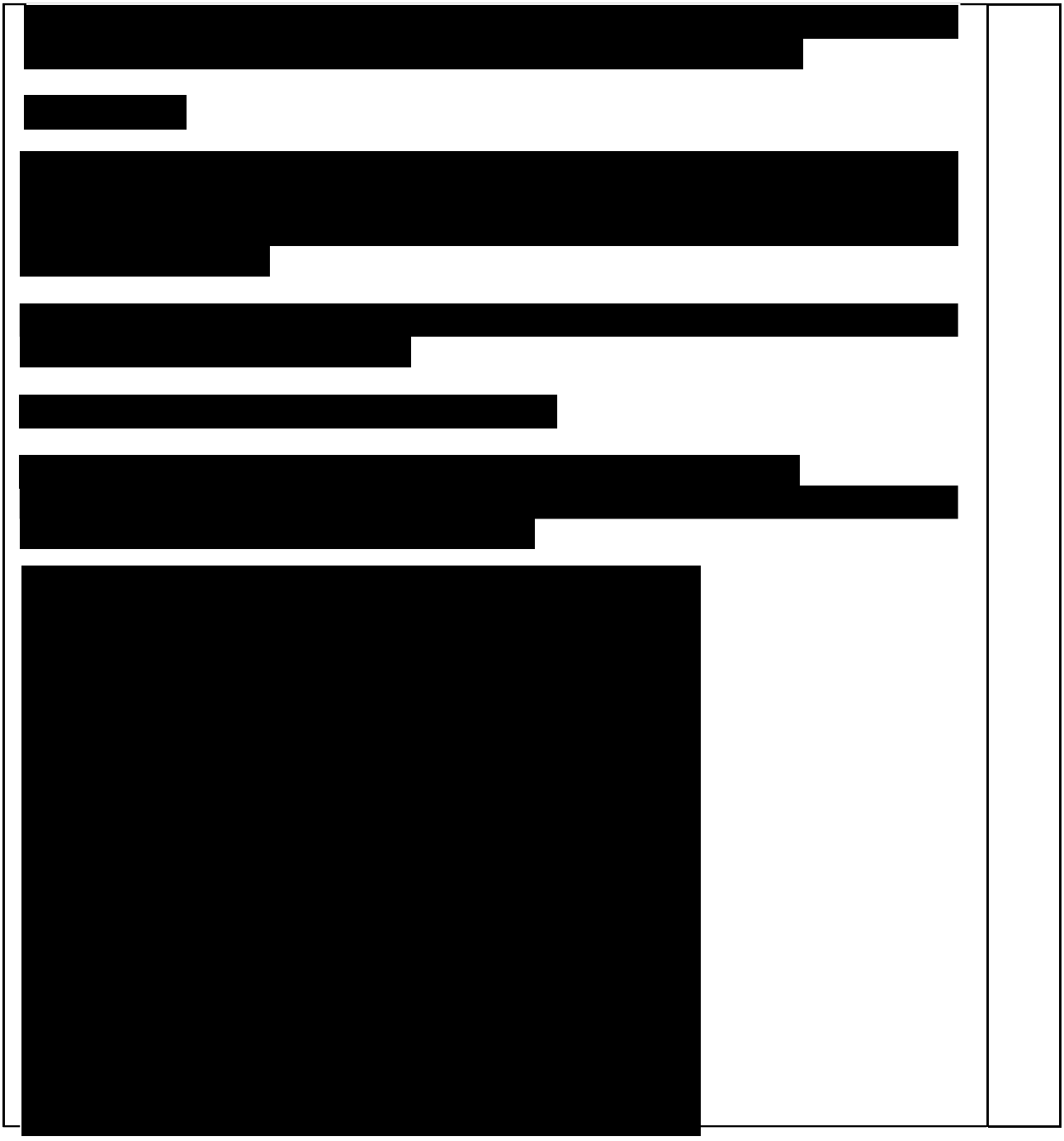
It should be possible to reconstruct and simultaneously display slices in multiple planes from the 3-D data set(s) provided (CT, MR, PET) with reference lines used to indicate the respective reconstruction planes.

Contractor Response. [redacted]	(E)



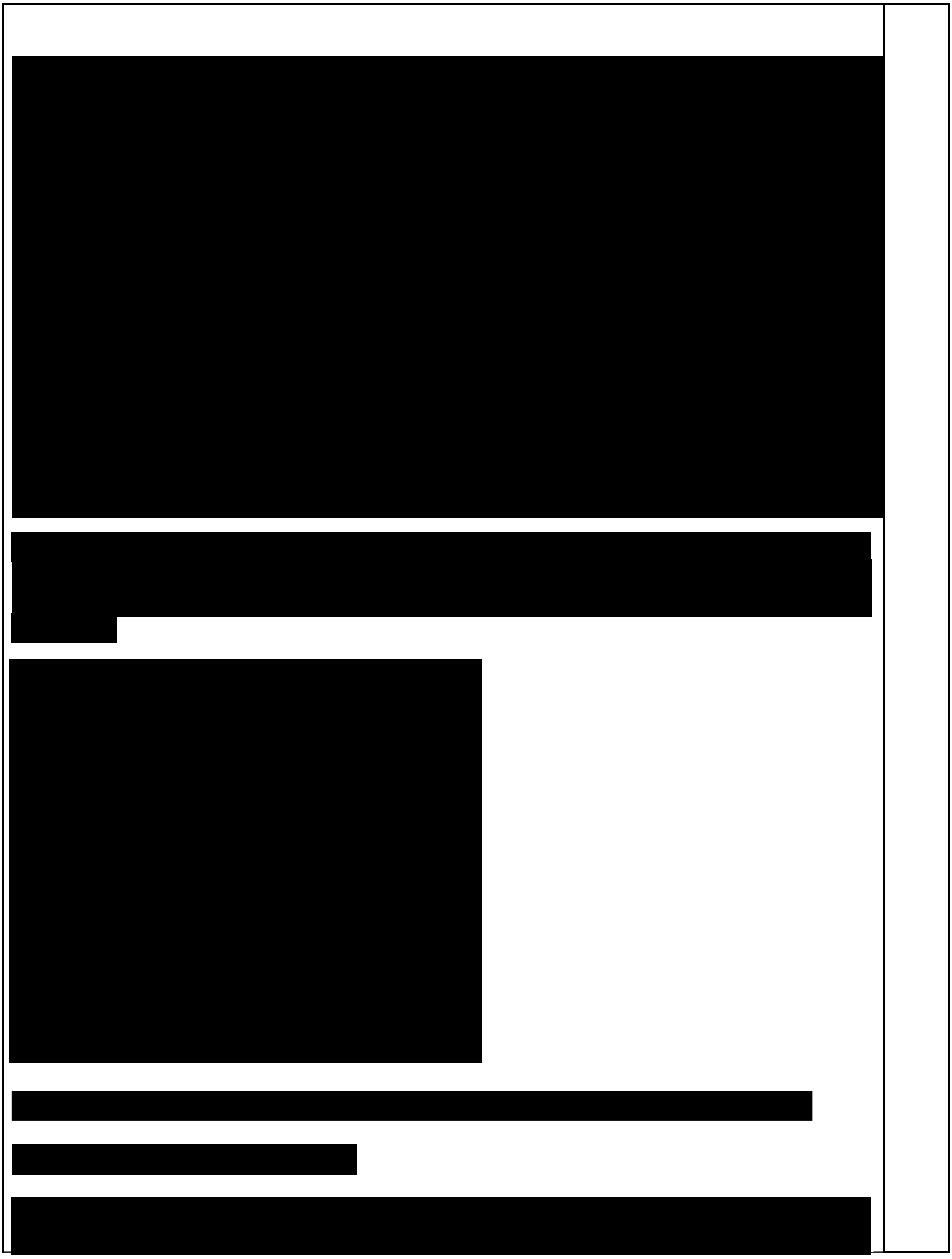


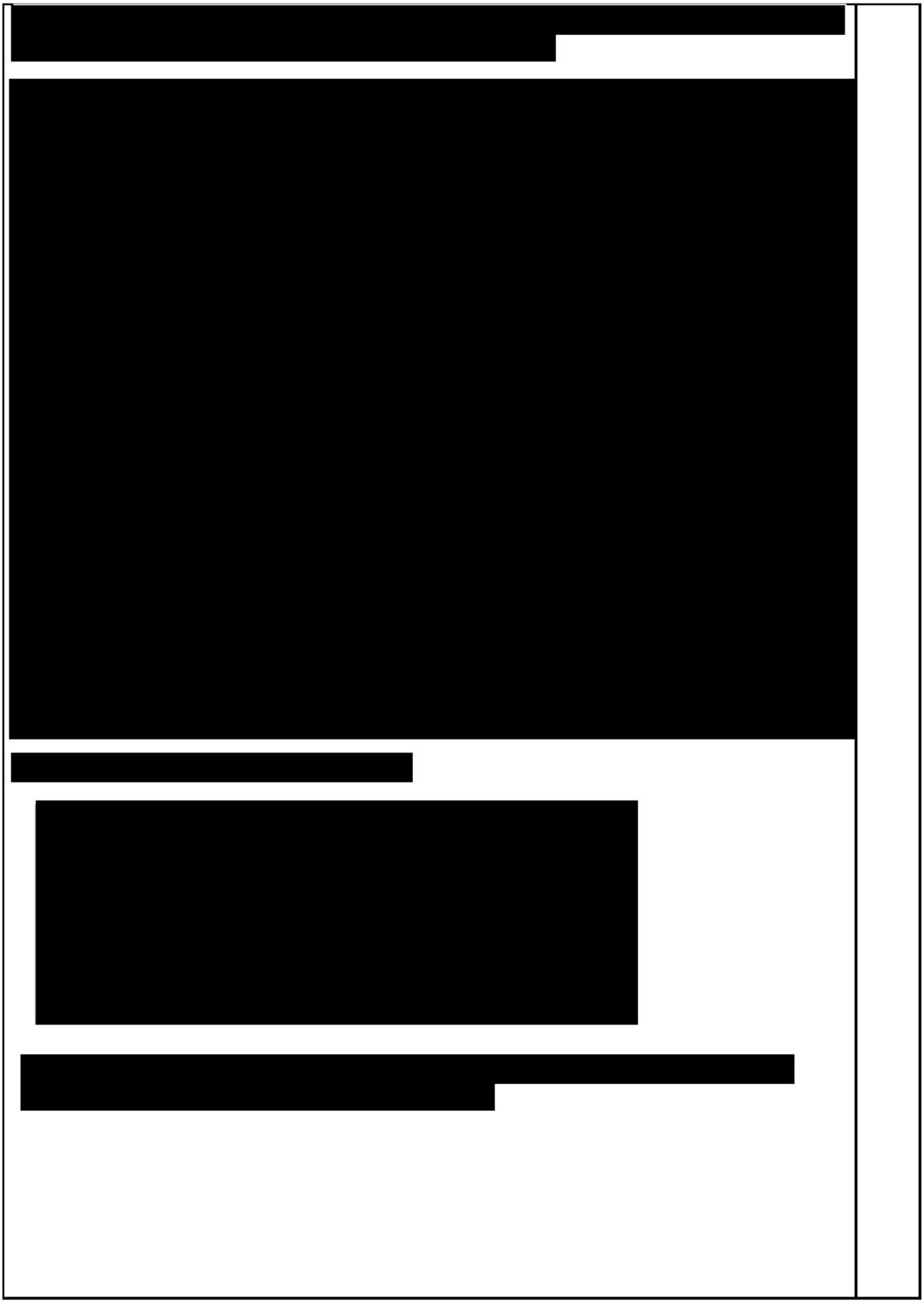


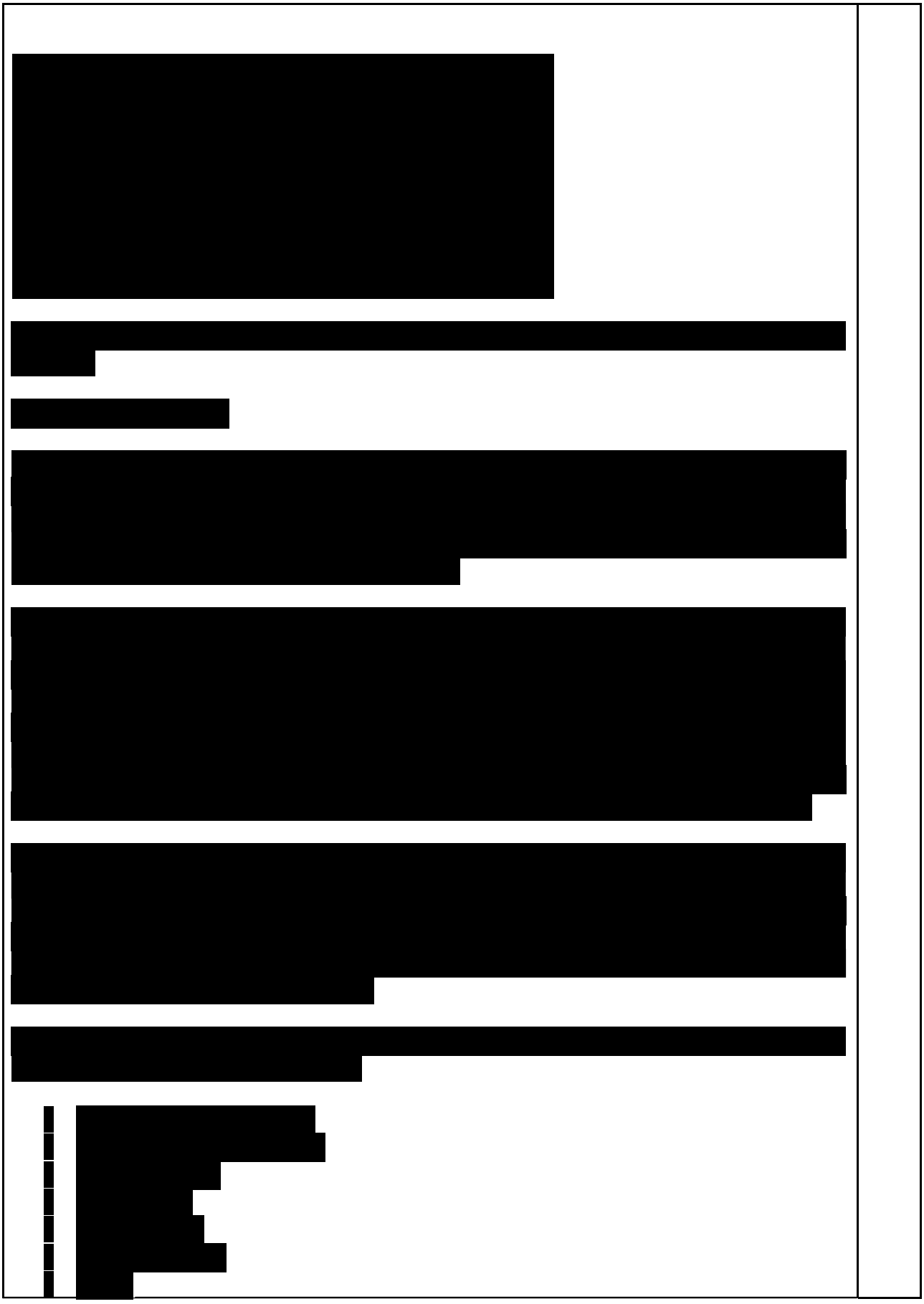


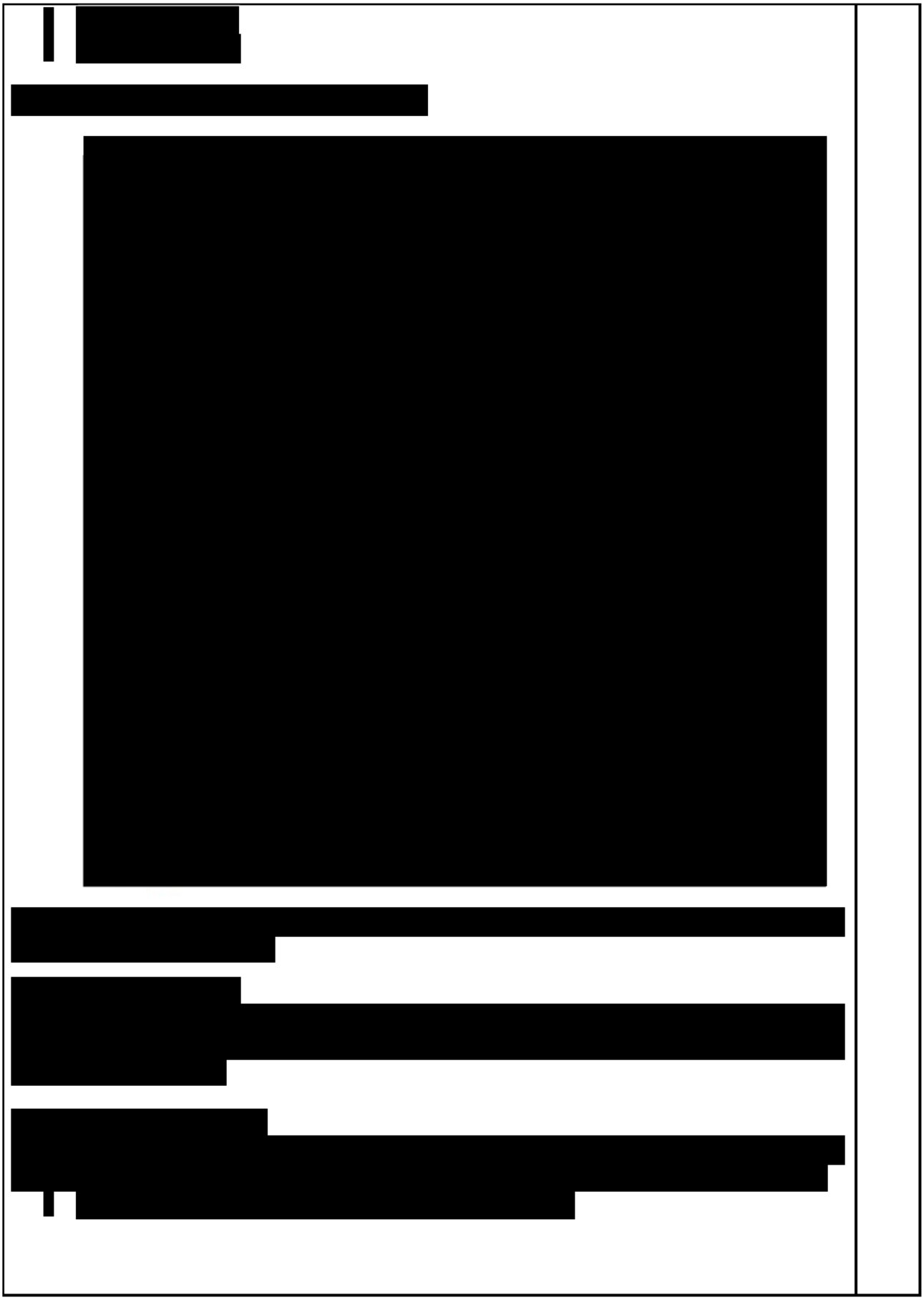
The TPS should be capable of image registration between CT/MR, CT/CT, CT/PET and CT/CBCT scans. Images with the same DICOM origin should be automatically registered. Provide details of the methods used e.g. manual, fiducial mark based, structure based, mutual information algorithm and rigid body or deformable and the maximum number of image sets that can be registered at any one time. Maximum flexibility in methods for simultaneous display of registered images is desirable. Please provide details.

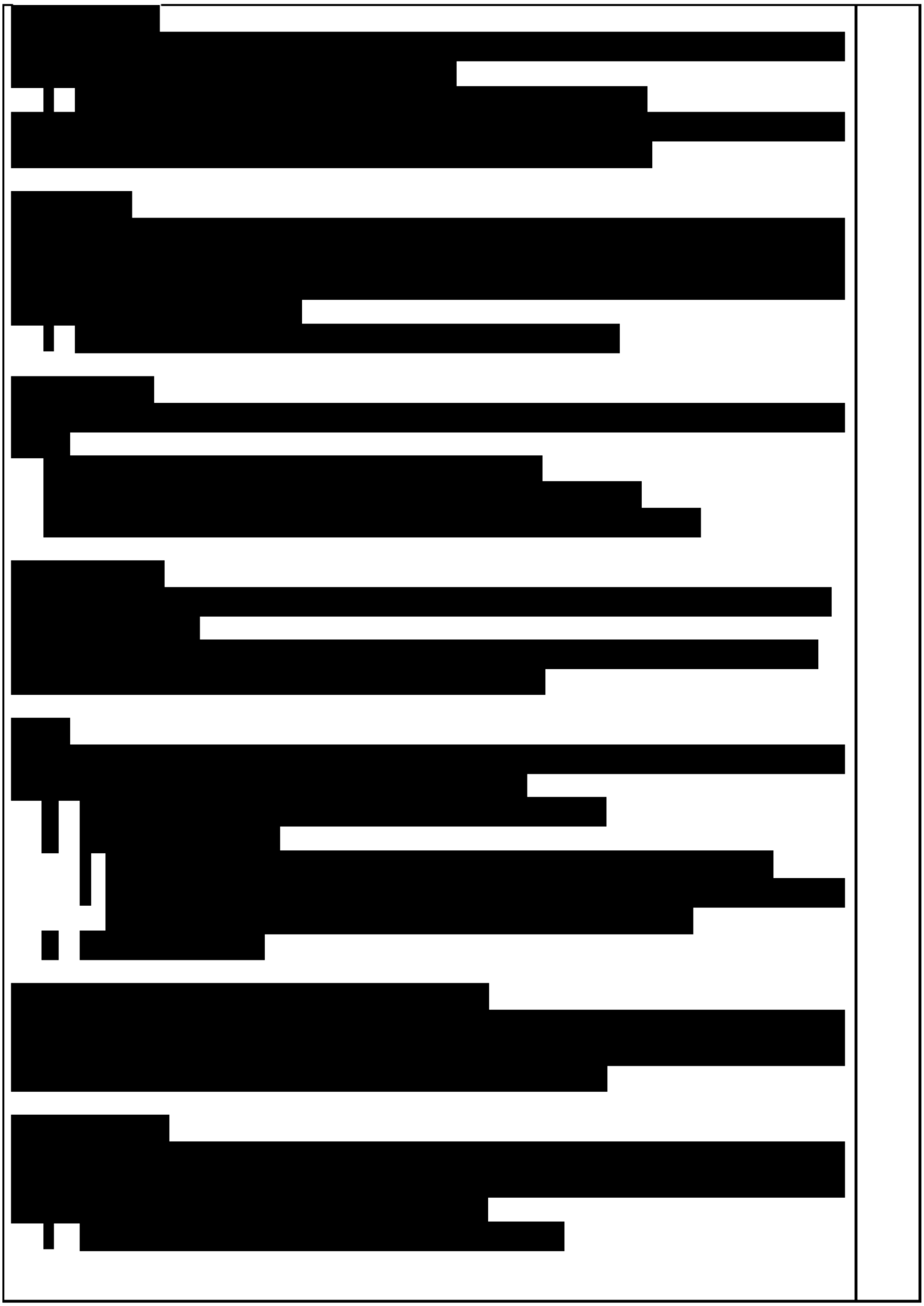
Contractor Response.	(E)

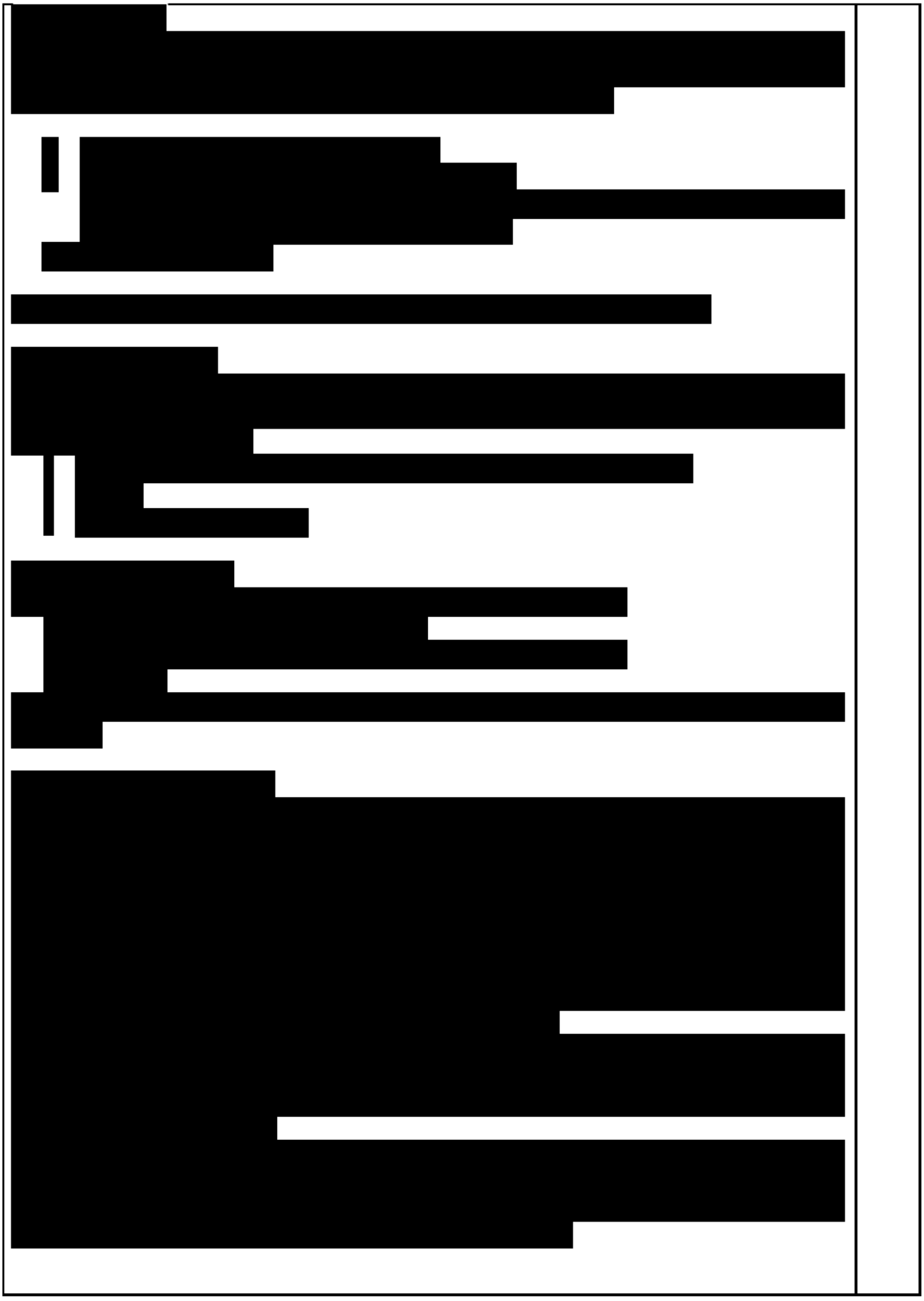


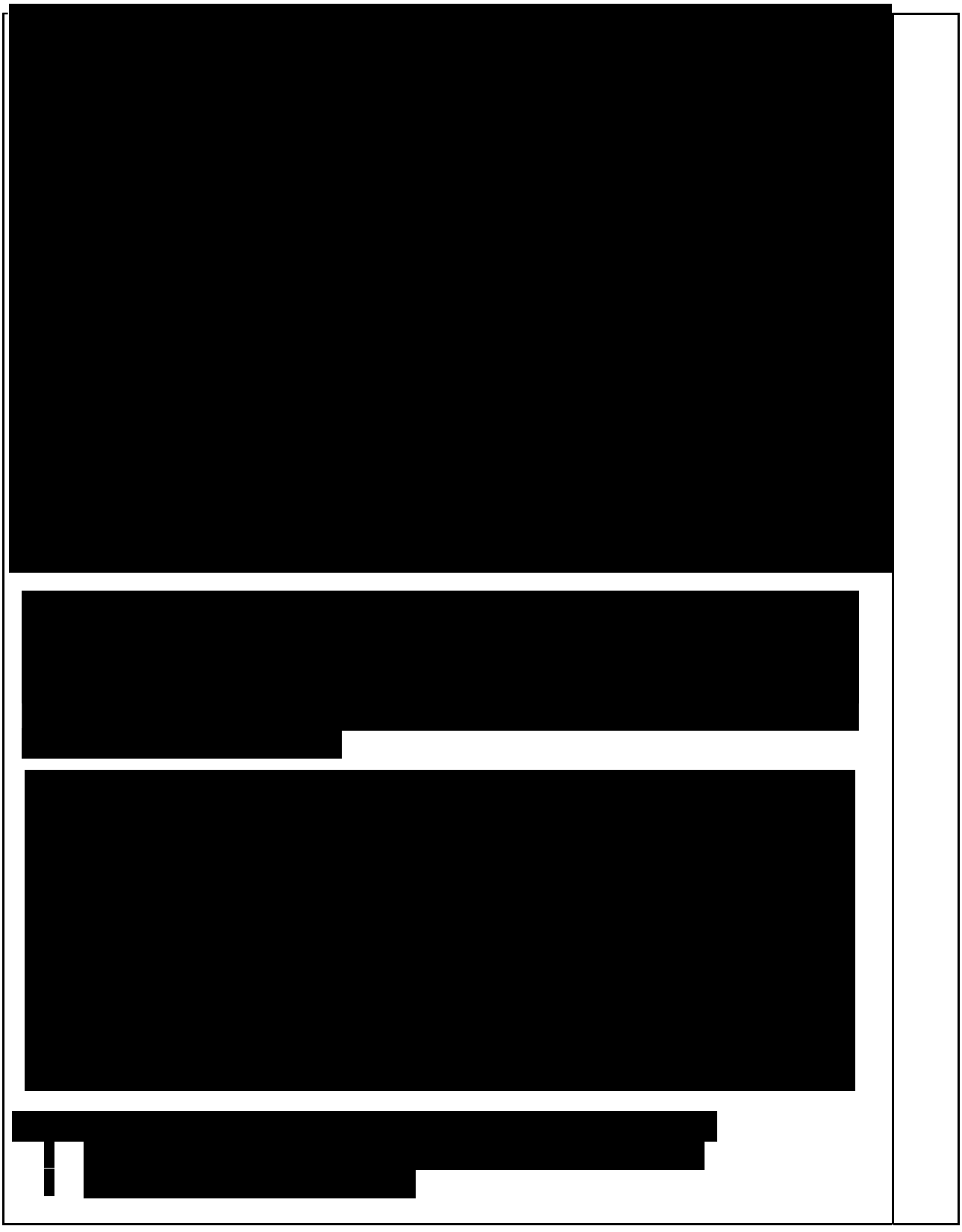








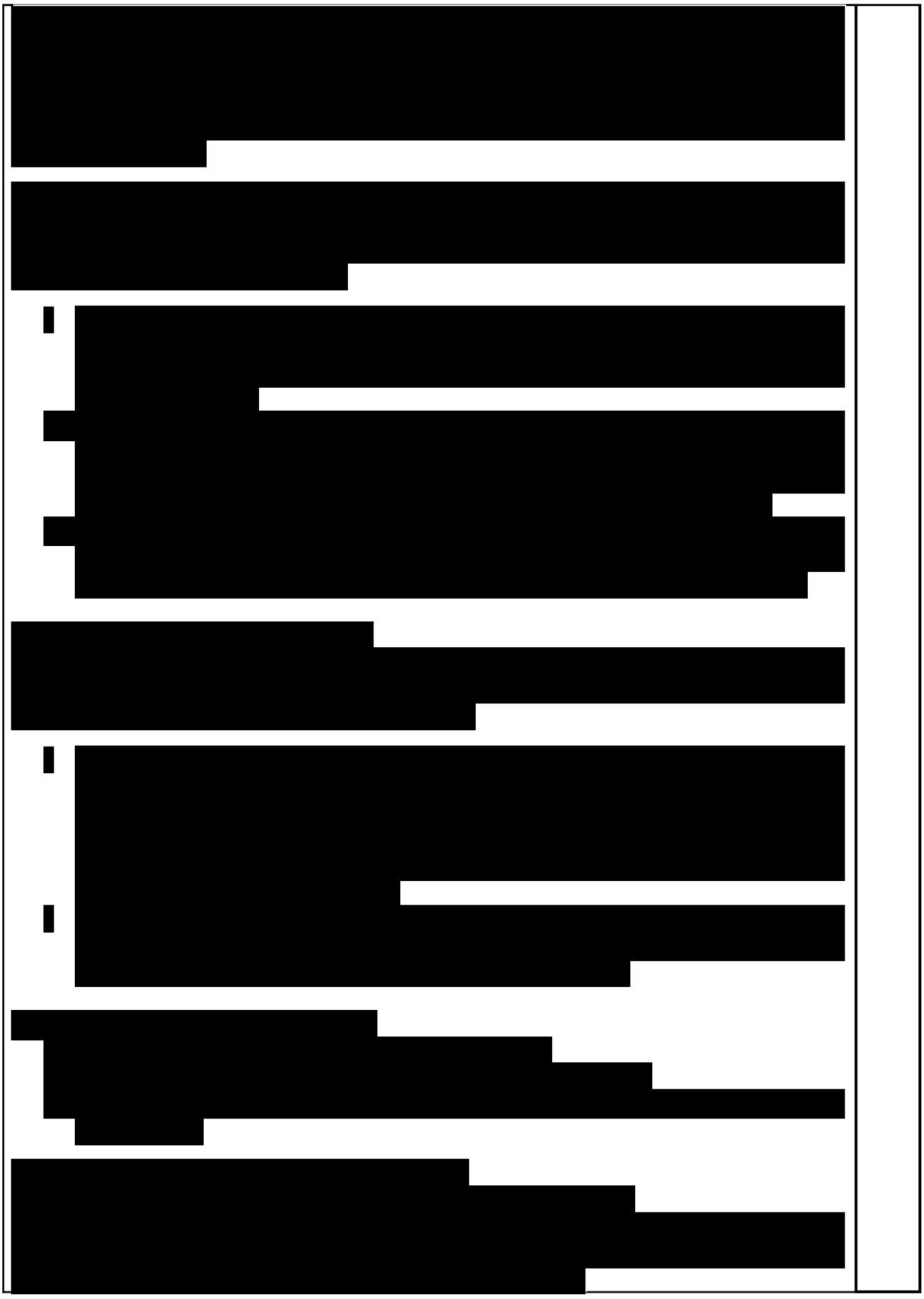


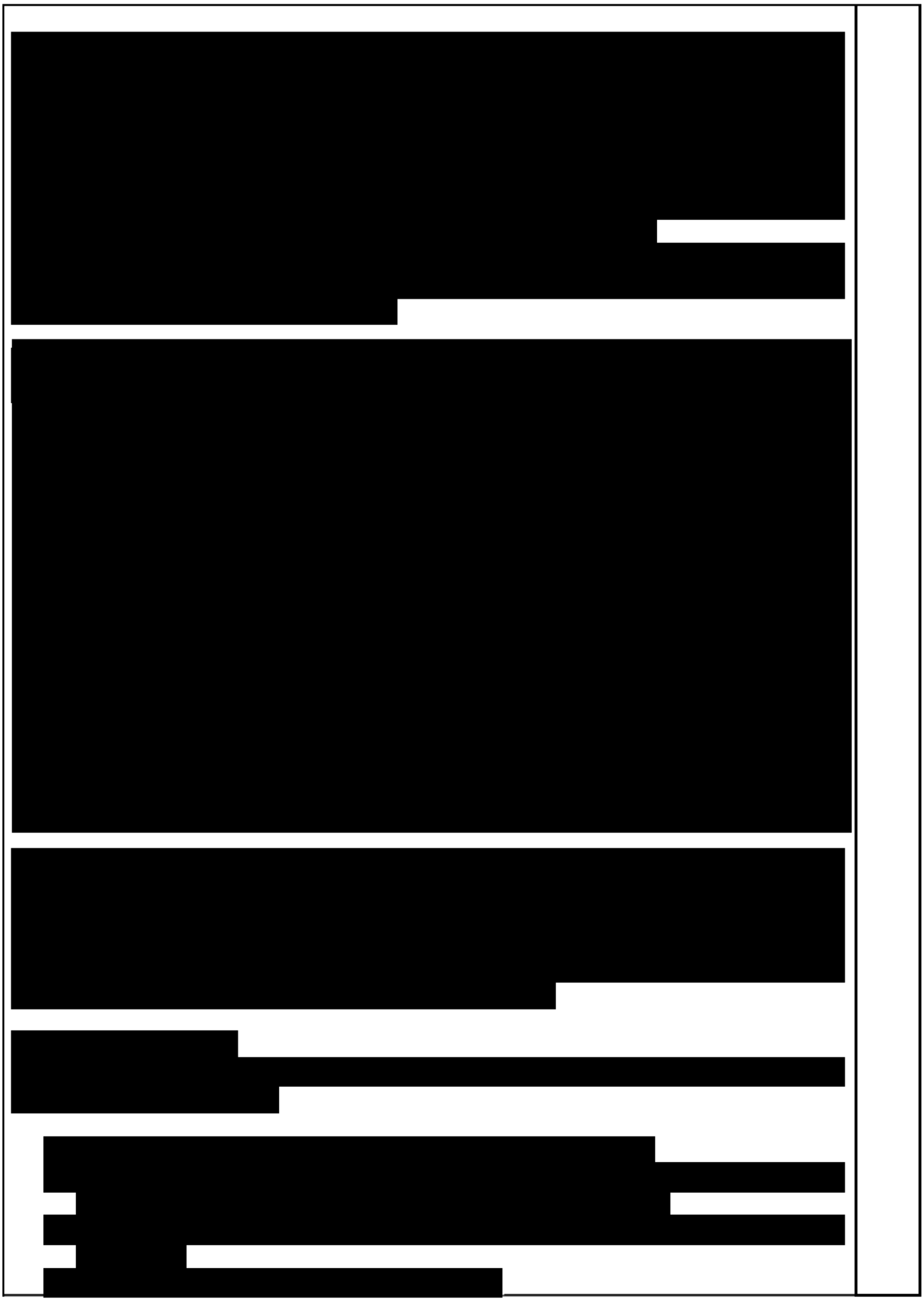


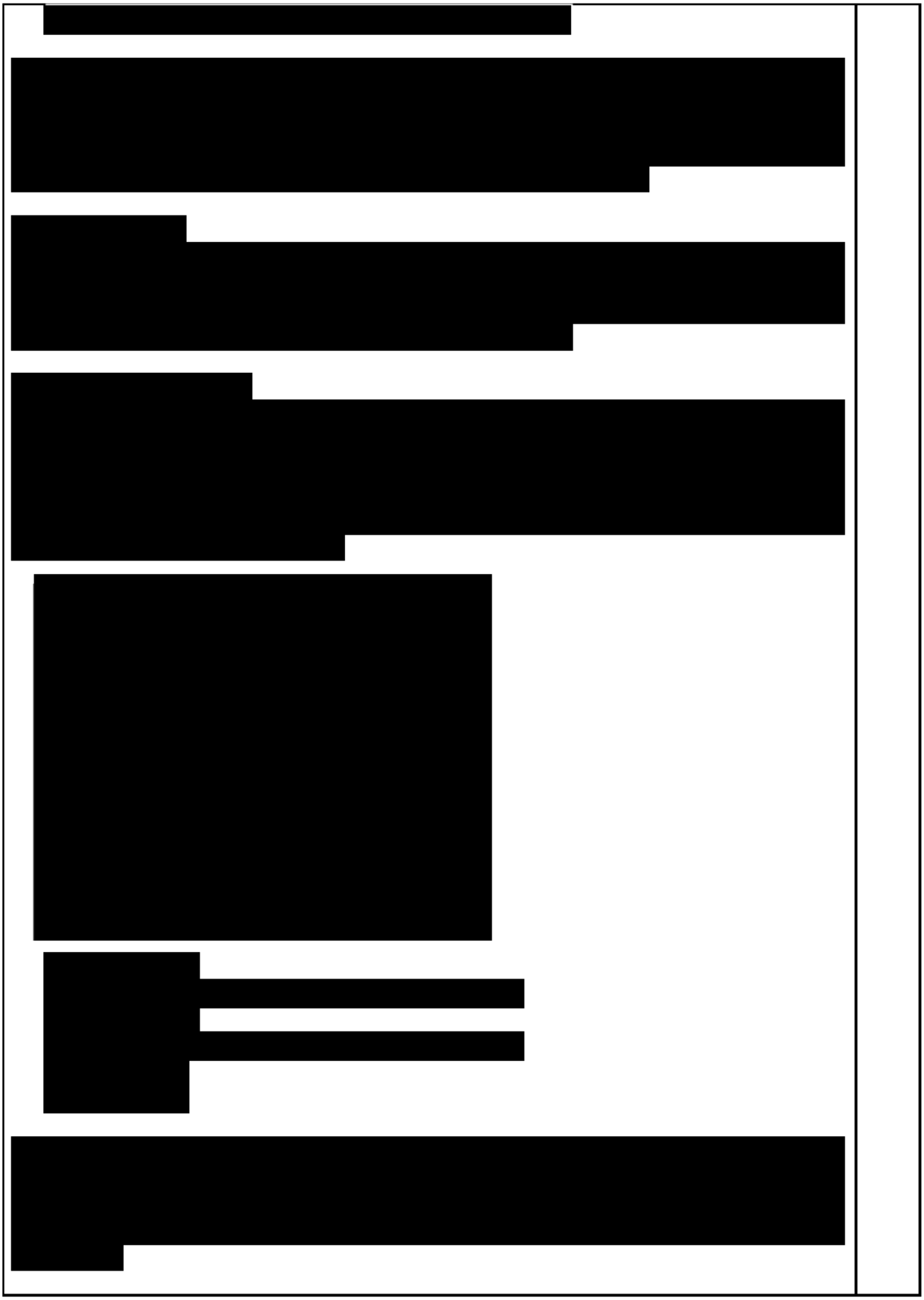
The TPS should provide maximum flexibility in the manual creation of structures in any reconstructed CT plane, in the number of allowed simultaneous structures. There should be a full range of positive and negative structure growth margins and Boolean Operations available and the ability to add bolus of a

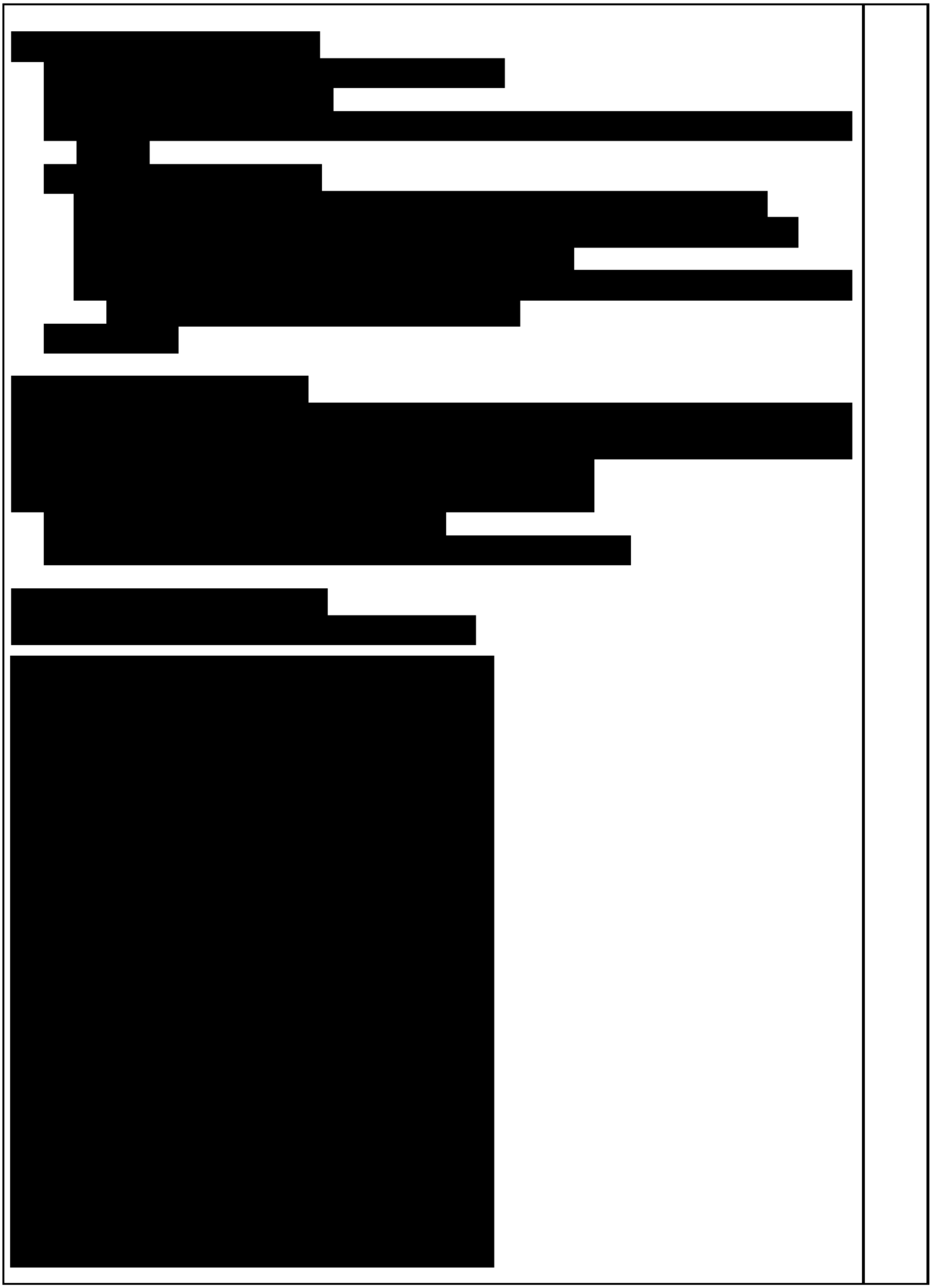
user-defined thickness and density to the external contour. Please provide information on these features.

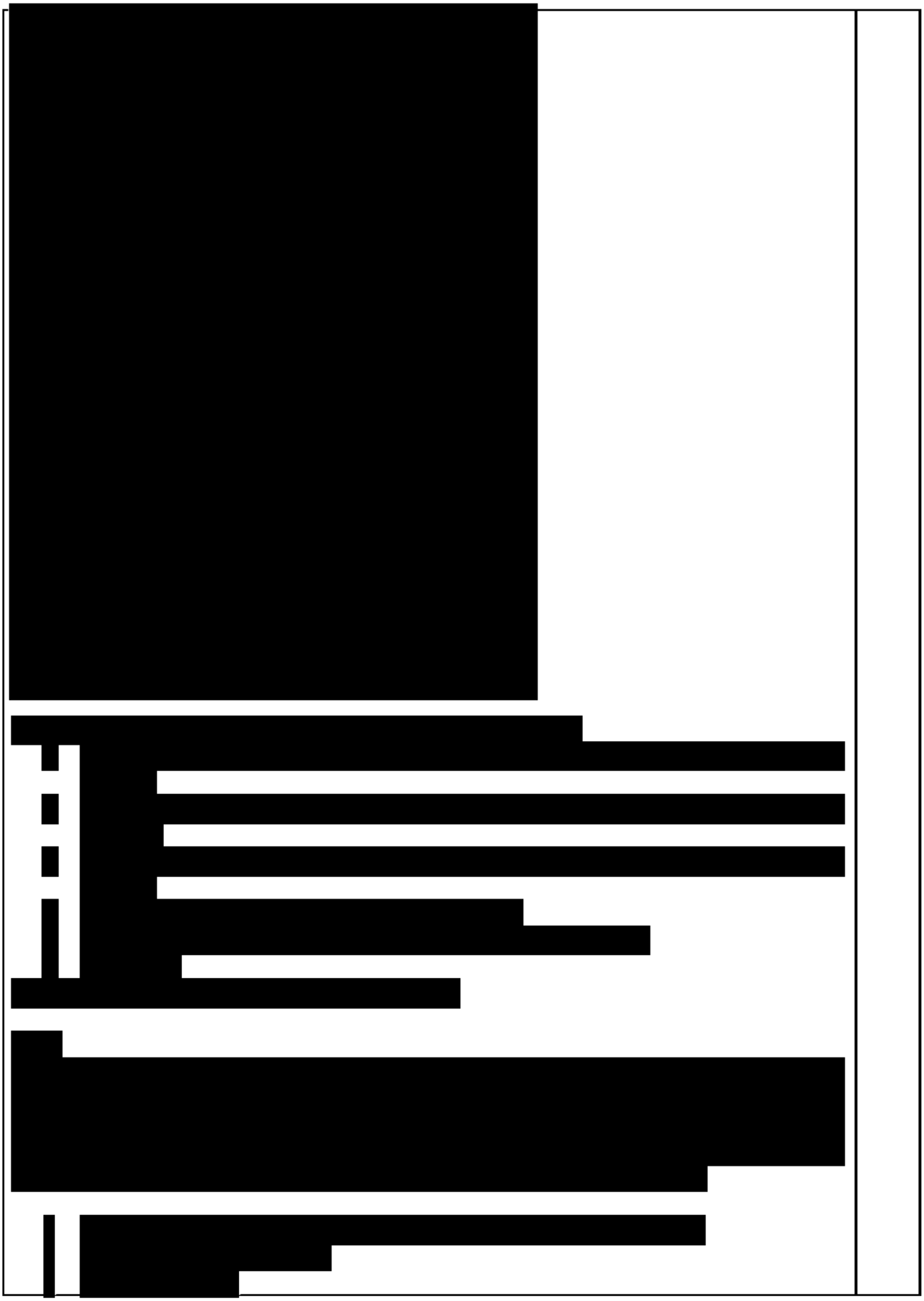
Contractor Response.	(E)

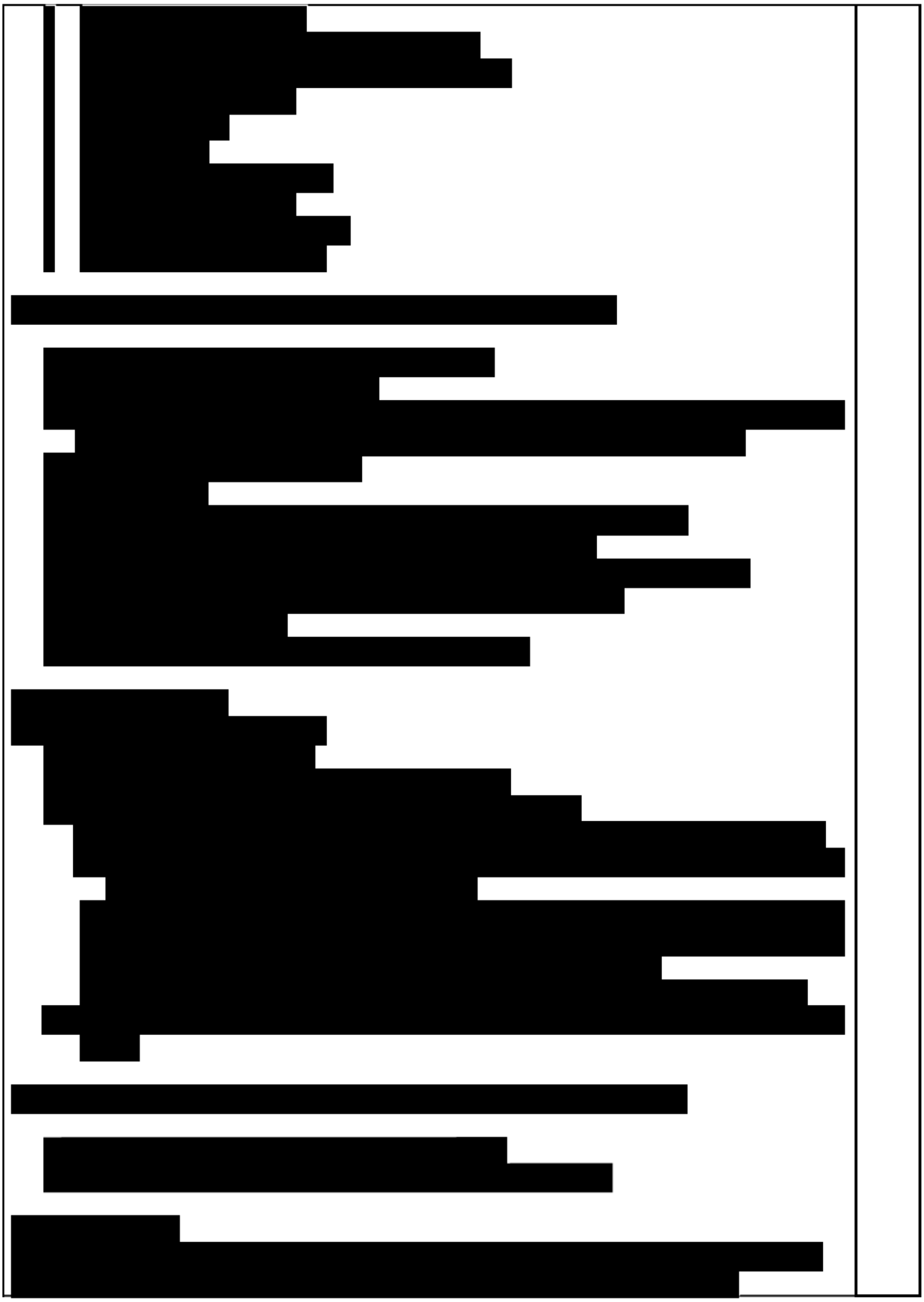


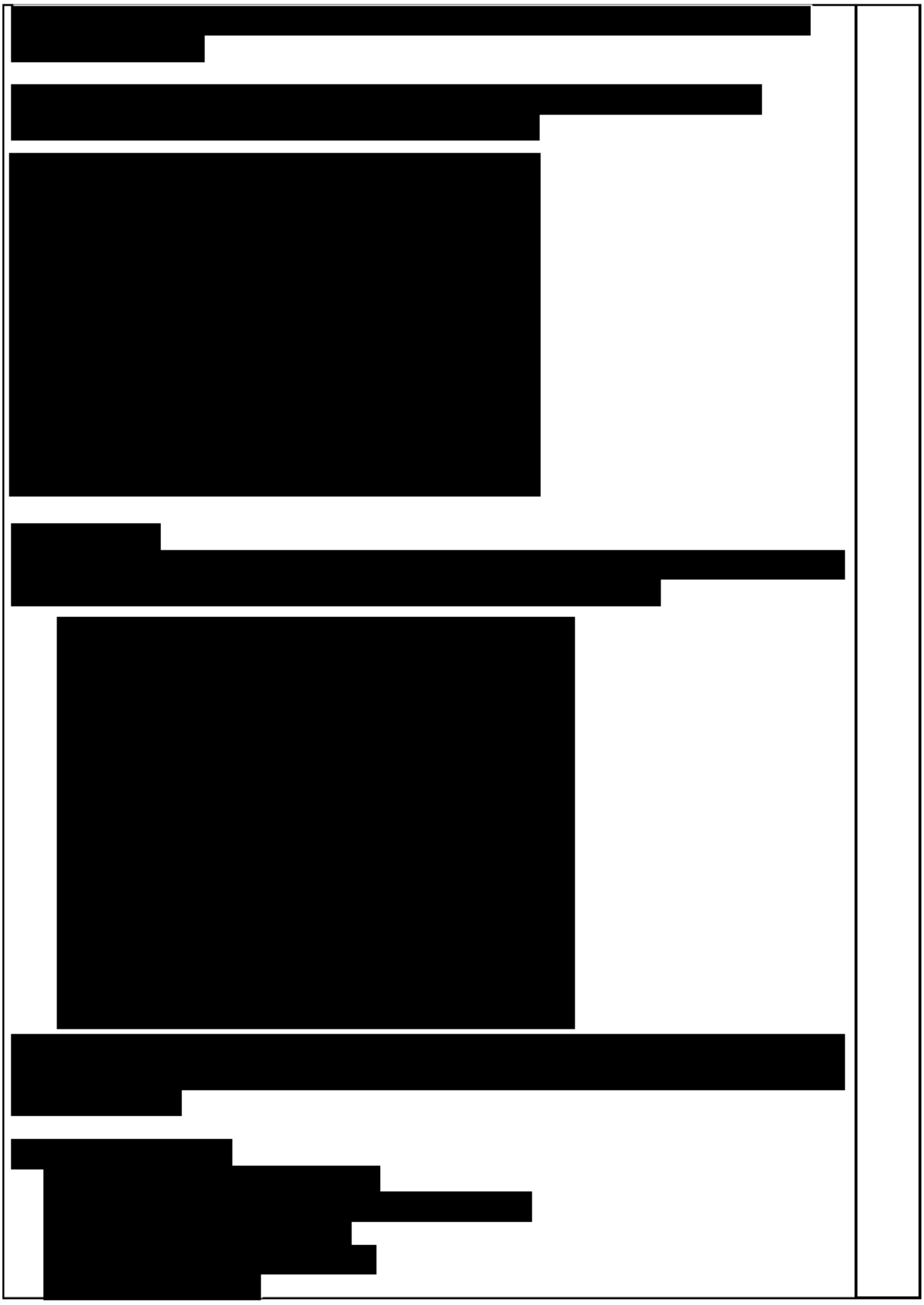








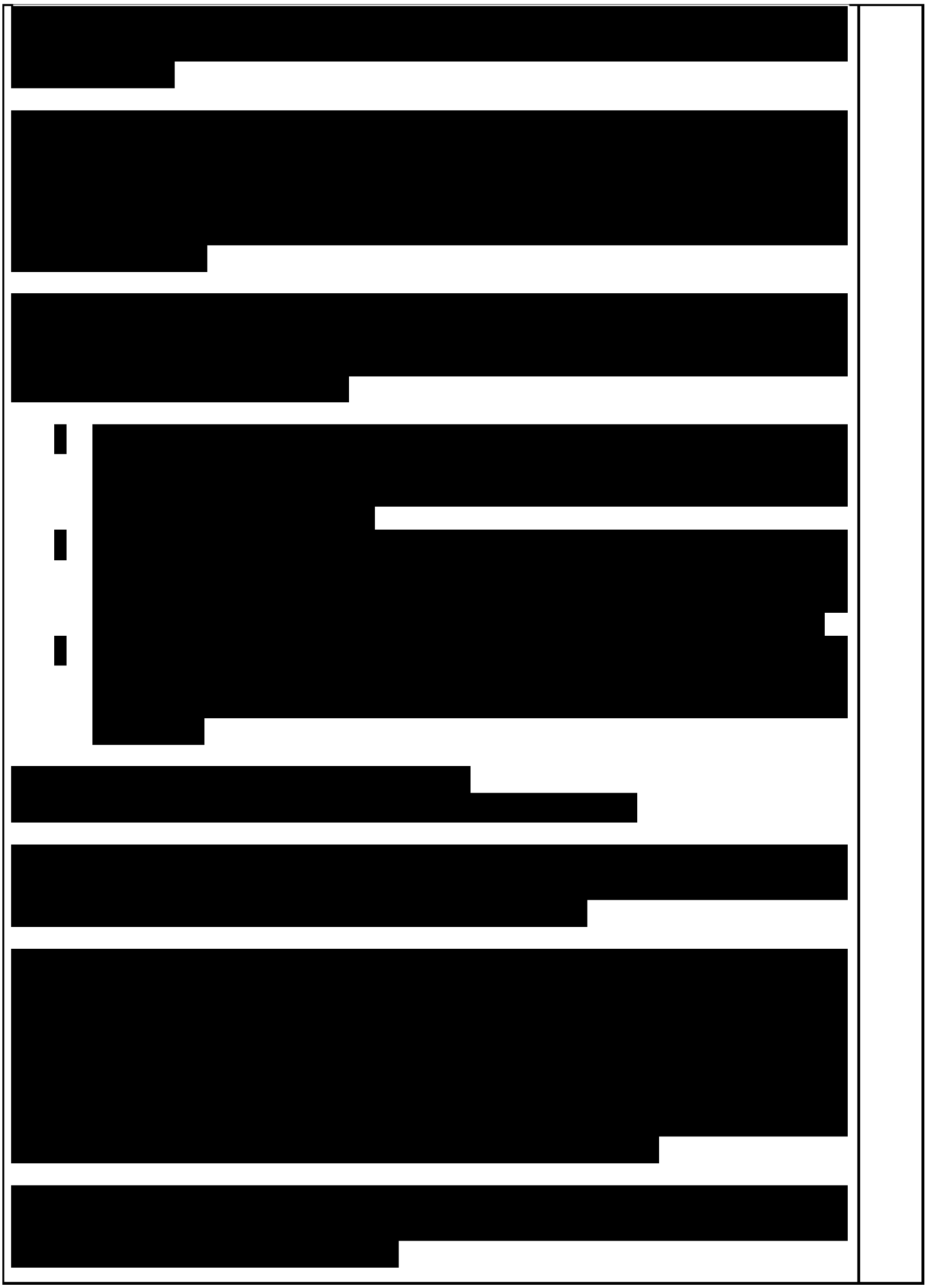


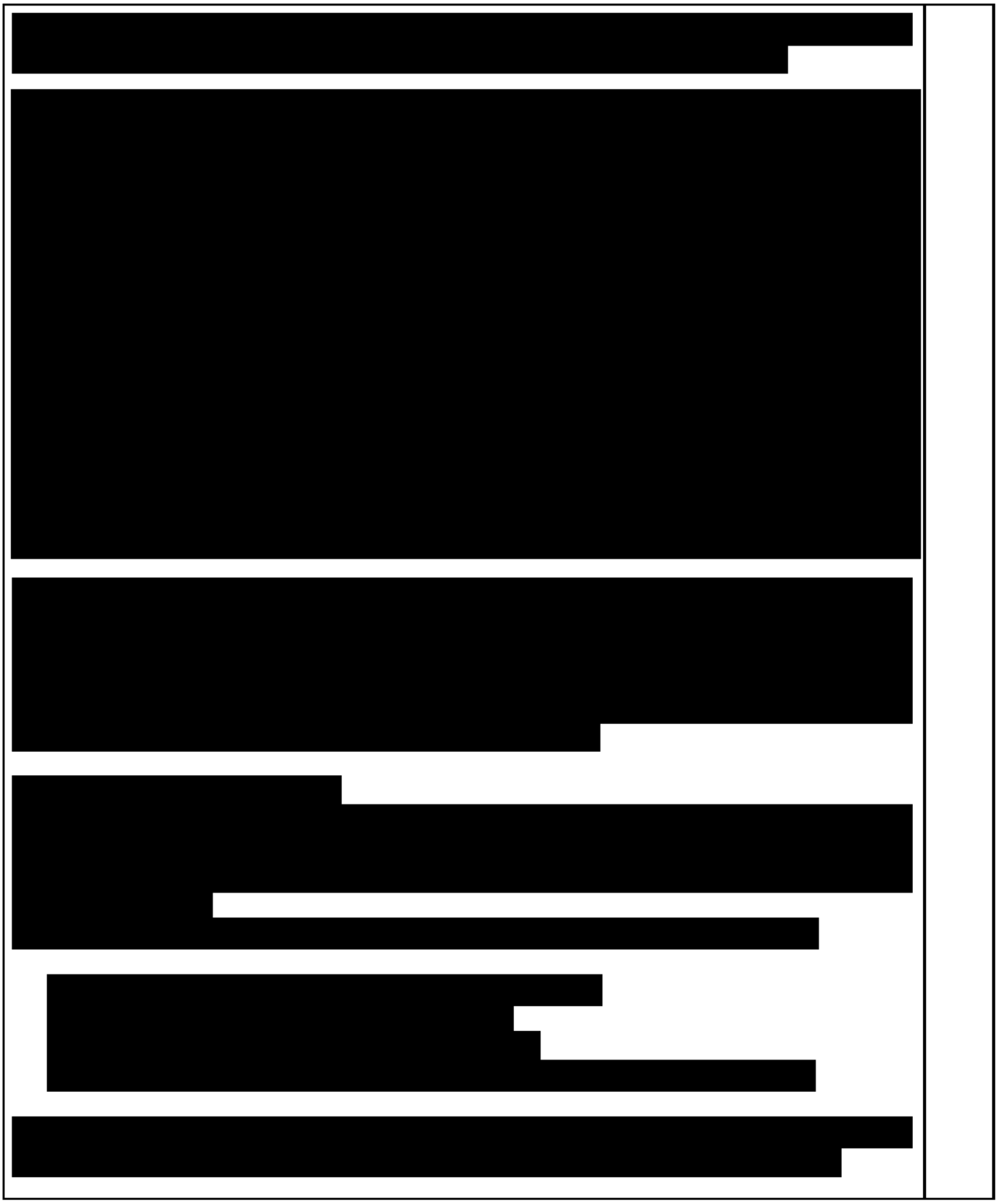


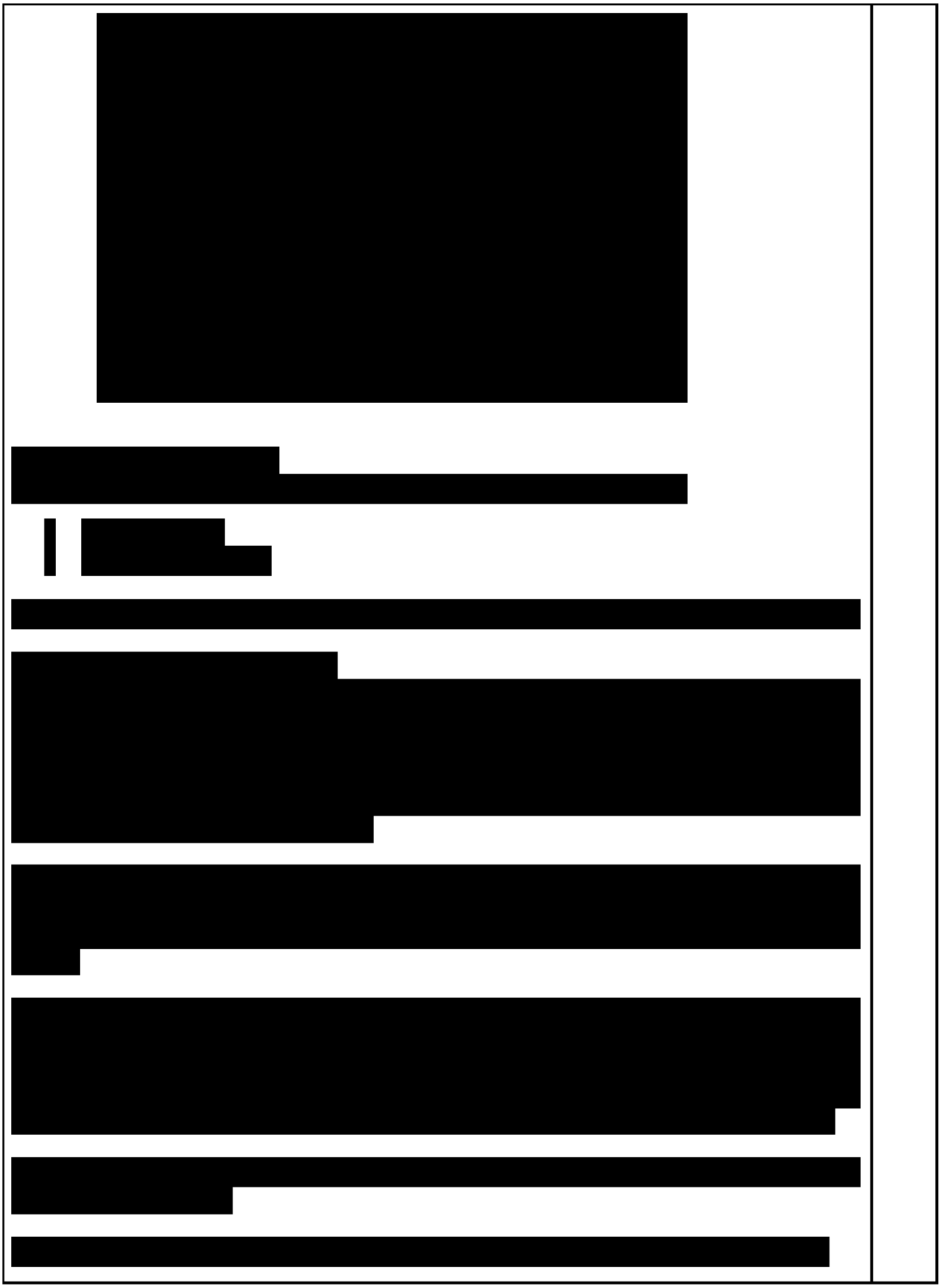
[redacted]	

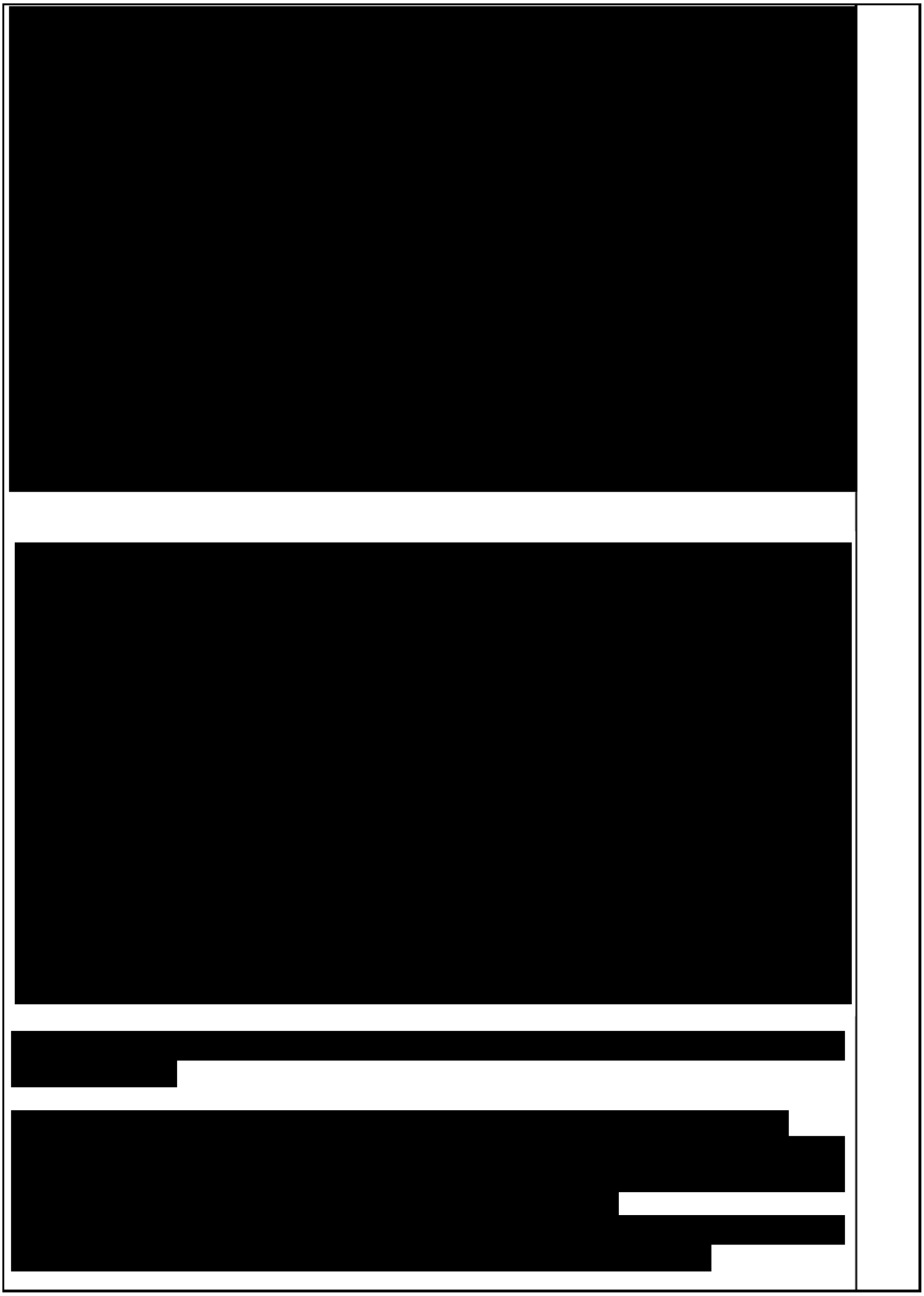
Tools for the automatic creation of ROIs are highly desirable. Please describe any tools available including those for the generation of external contours, organs at risk and targets. Describe the methods available, e.g. density threshold, library based etc. and any limitations to the range of anatomy that the software can be used on.

Contractor Response.	(E)
[redacted]	





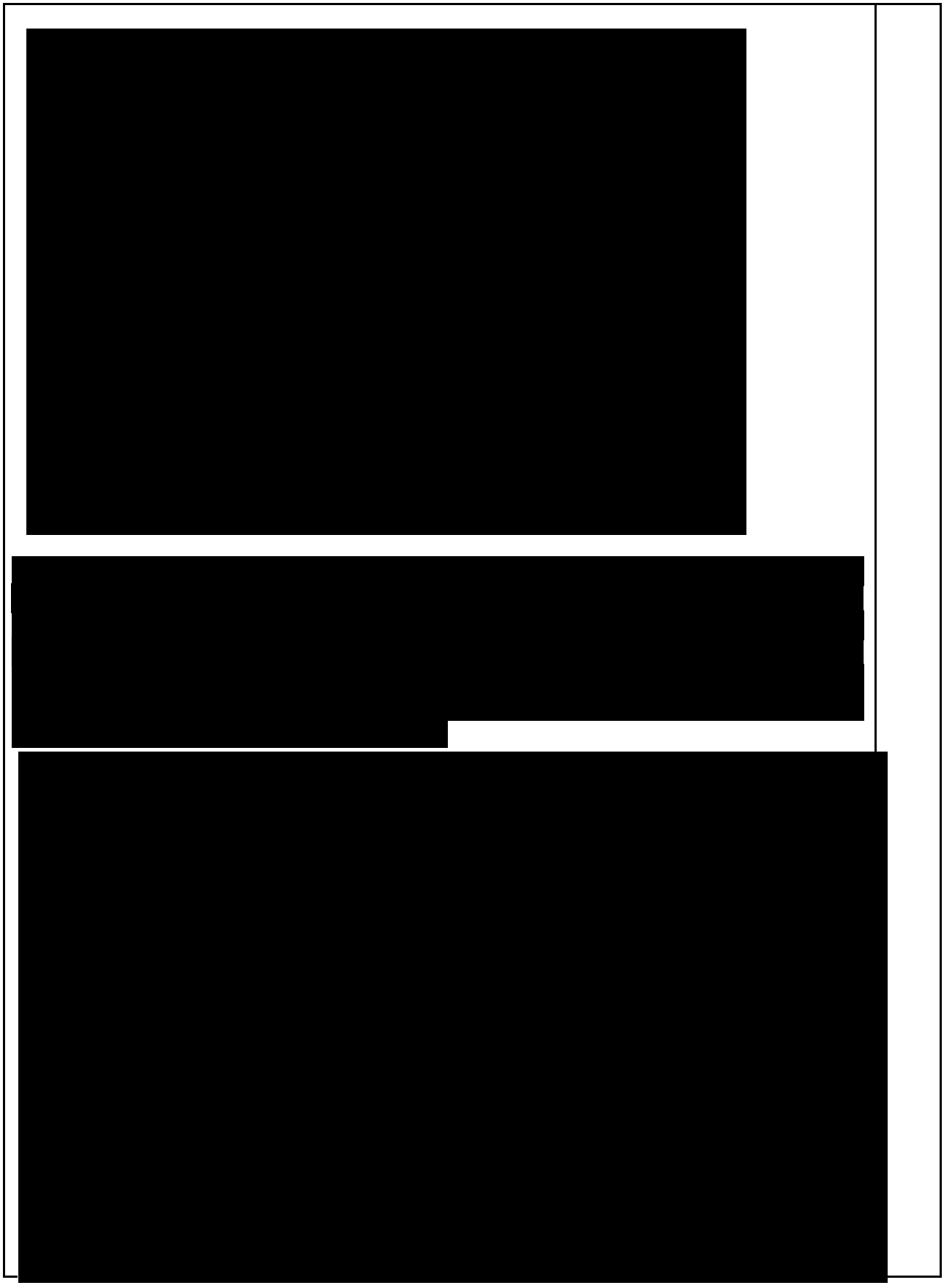


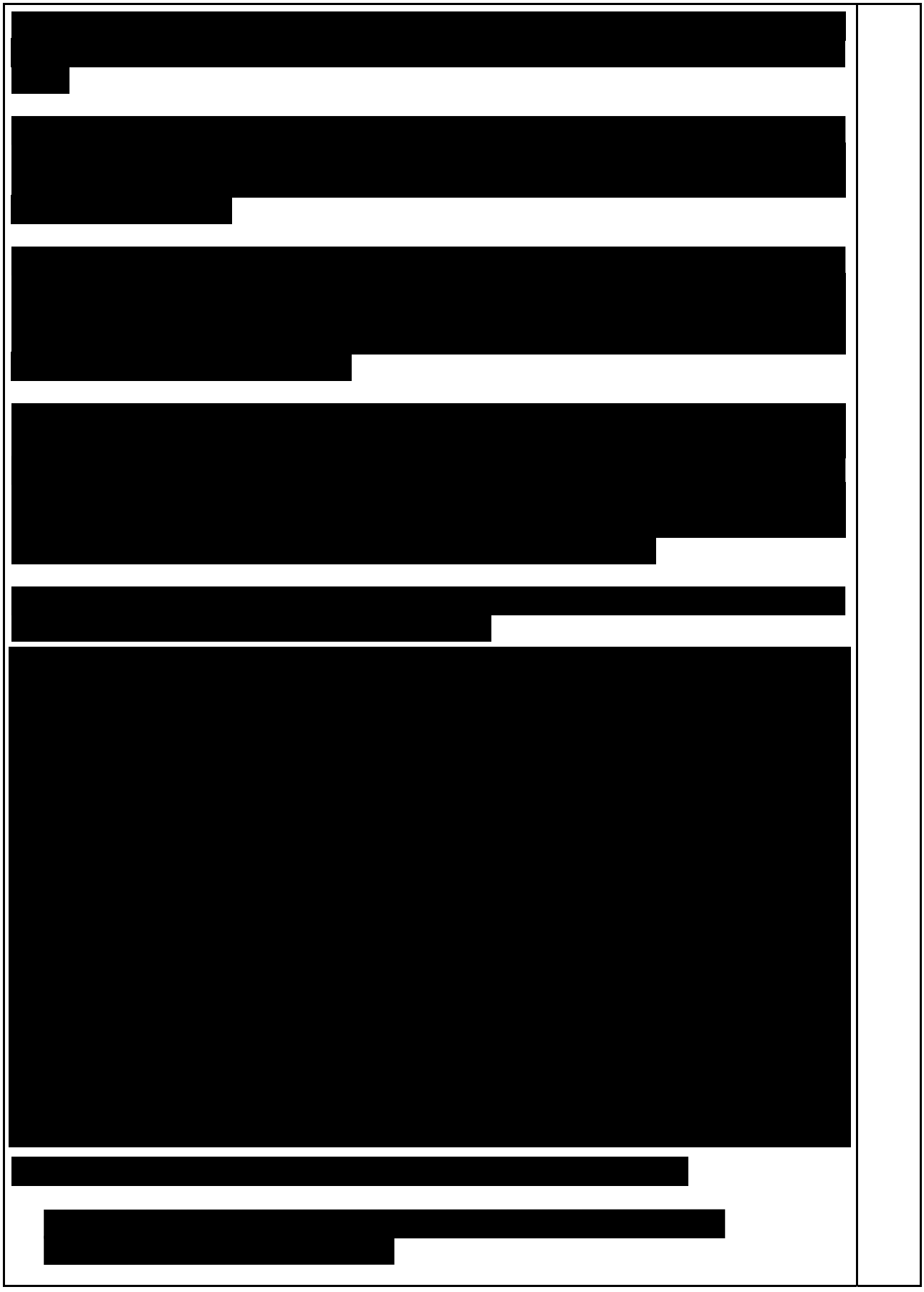


[redacted]	

Tools for the viewing and planning of 4D CT datasets from the installed CT scanner and 4D acquisition software should be provided. Please also describe support for importing and handling of multiple, 4D-CT image sets with techniques for registering data to positions in the breathing cycle and creation of image / volume reconstructions including MIPs, Ave IPs etc.

Contractor Response. [redacted]	(E)





4.2.4 General Planning Tools

The TPS should provide the ability to interchange treatment machines for all beams, with the flagging of non-compatible machine change requests. Treatment machine changes between compatible machines should be possible without MLCs, monitor units, control points etc. being edited or deleted for all treatment modalities.

Contractor Response.	(E)
[redacted]	

[redacted]	

The ability to move the isocentre of all beams simultaneously by cursor and mouse control on a screen display is required.

Contractor Response. [redacted]	(E)

The ability for asymmetric collimation planning in both axes (where specified in the beam-data set) is required.

Contractor Response.	(E)
[redacted]	

The TPS should have the ability to utilise the density information provided by the CT slices to correct both photon and electron dose distributions for inhomogeneities on a pixel by pixel basis or block - “bulk correction” - as selected by the user.

Contractor Response.	(E)
[redacted]	

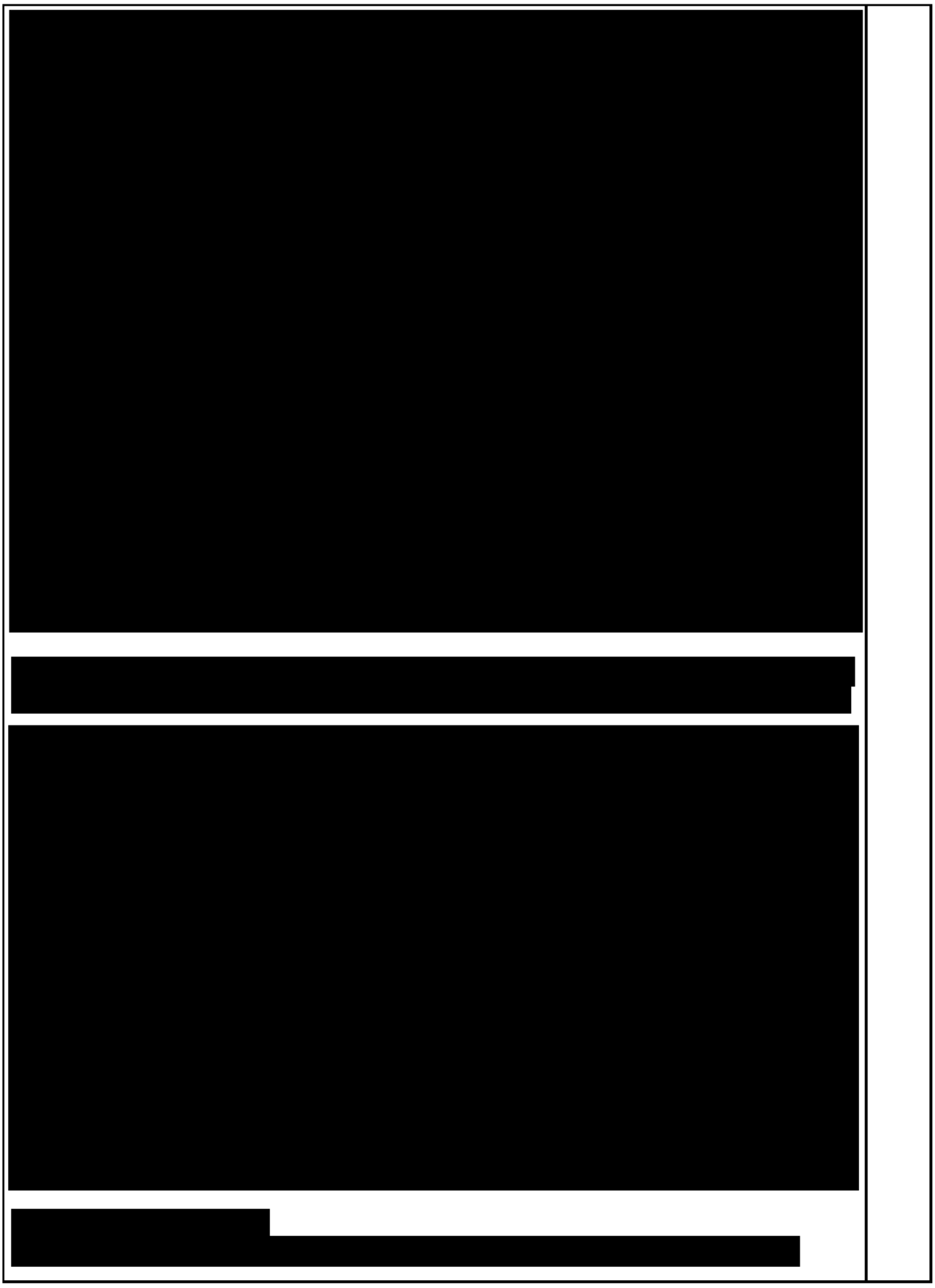
[redacted]	

The TPS should have the ability to include non-coplanar fields in 3-D plans; the off plane angle should be specified clearly, and unambiguously, e.g. caudal/cephalic tilt.

Contractor Response. [redacted]	(E)

Structures, beams, and isodoses should be displayed in colour over a greyscale CT image on the display screen with the dose distribution displayed in a visibly obvious manner such as colour-wash, dose-band or isodose line, selectable by the user.

Contractor Response. [redacted]	(E)



[redacted]		

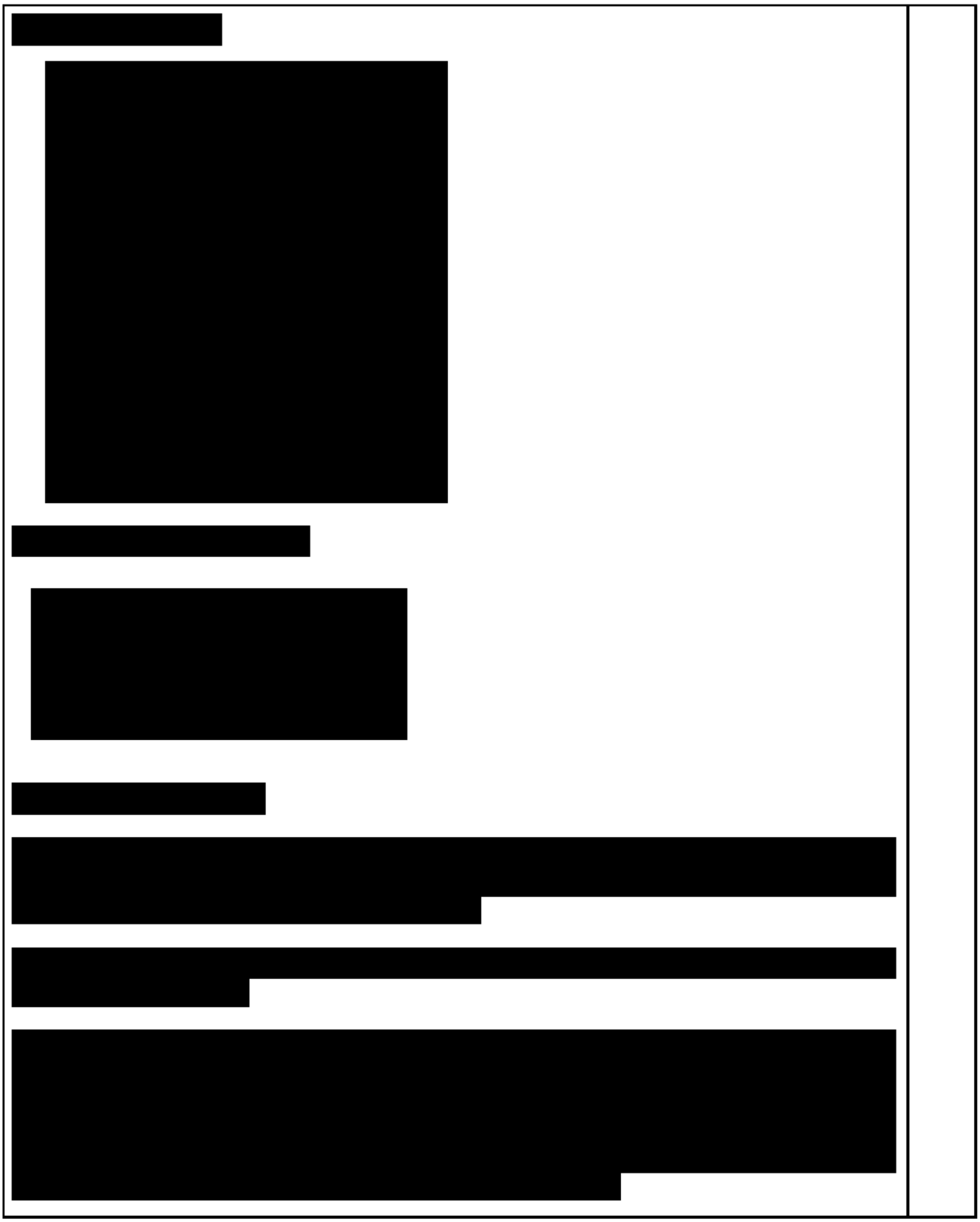
Facilities for adjusting the contrast and intensity of all image types using window level/width and to enlarge (zoom) any image should be available.

Contractor Response. [redacted]	(E)

Facilities for measuring distances and angles, overlay measurement grids and display points should be provided.

Contractor Response. [redacted]	(E)

[redacted]



Facilities for automatically optimising collimator angle, position symmetric and asymmetric collimators and for generating multileaf collimator positions, with the choice of an automatic margin, a variable margin or manually defined margin in BEV mode should be available. Manual input / adjustment of leaf, jaw and collimator should also be possible.

Contractor Response.	(E)
[redacted]	

[redacted]	

Facilities should be provided to make it possible to generate a simulated surface reconstruction of the patient and, in BEV or observer's eye view mode, to show the position of the virtual light field projection including shaped fields (MLC or block), central ray and vertical and lateral projections of the isocentre onto the skin together with the position of the simulation laser projections and fiducial marks.

Contractor Response. [redacted]	(E)

[redacted]

[redacted]

[redacted]

The TPS should be able to model Isocentric & fixed SSD planning, including extended SSD at least to 150 cm with field sizes ranging from 2x2 cm to 40x40cm (plus shaping where required) at 100cm.

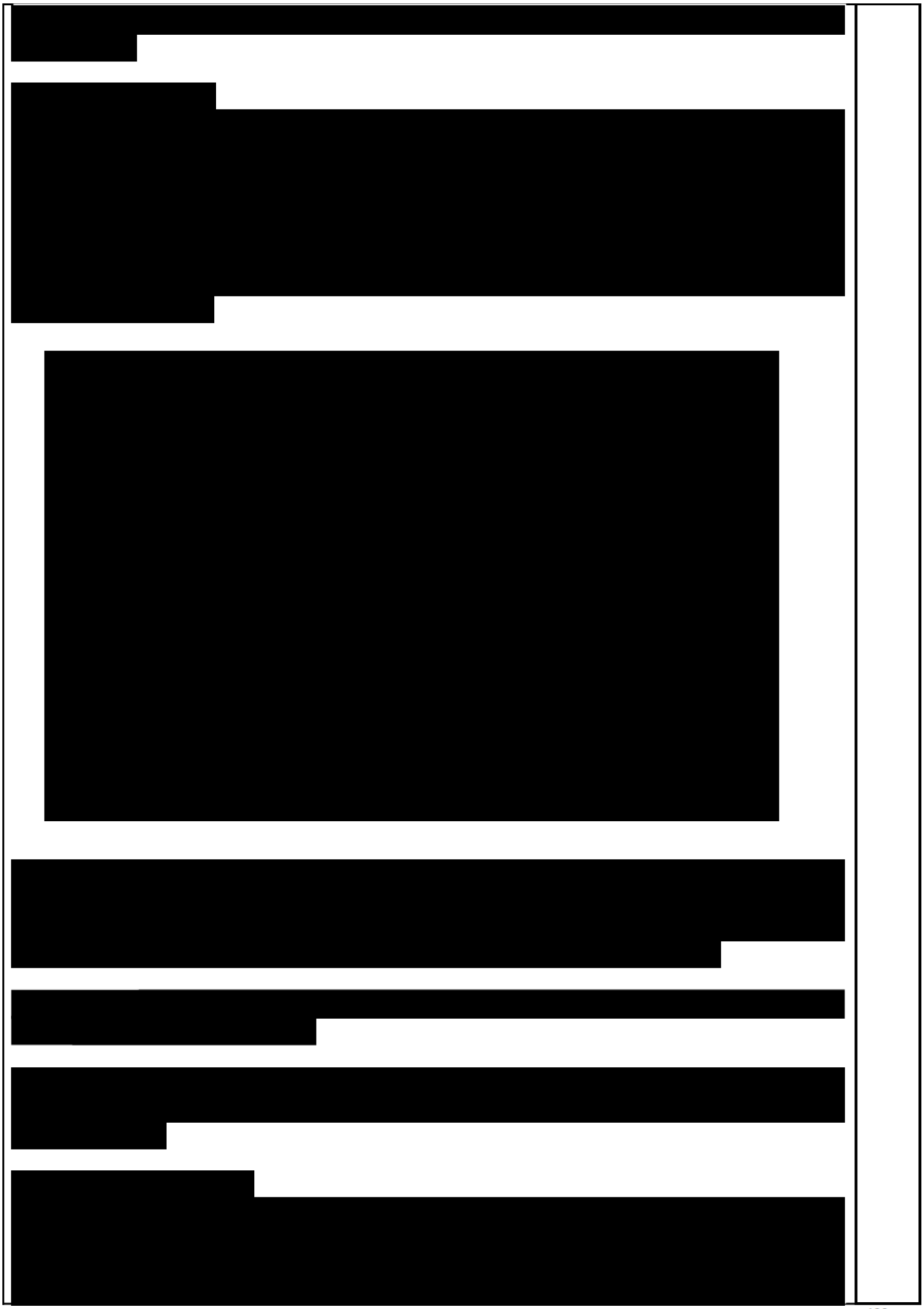
Contractor Response. (E)

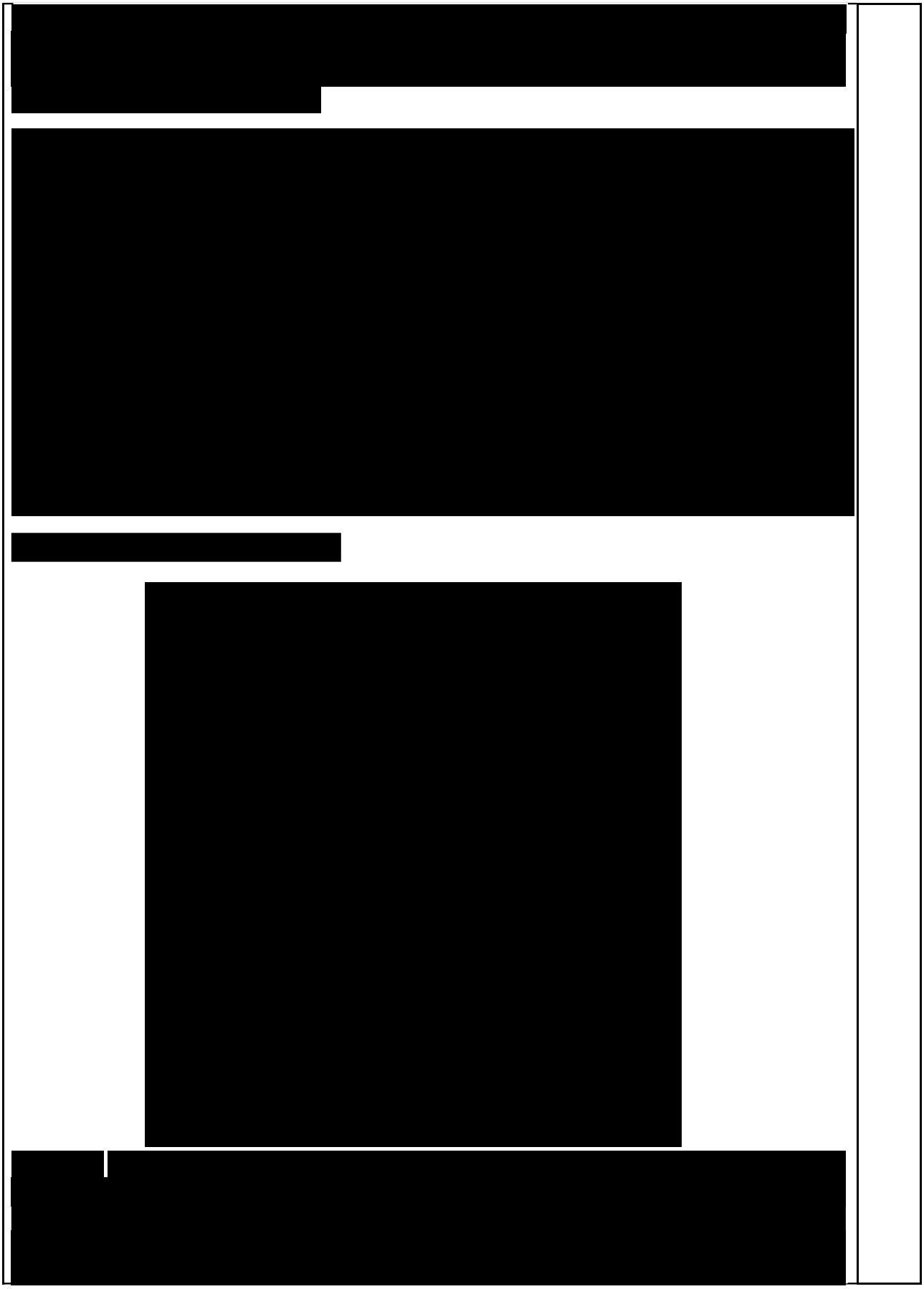
[redacted]

[redacted]	

The TPS should provide comprehensive Dose Volume Histogram calculation and display including the ability to overlay DVH data from different plans, the ability to sum the dose from multiple phase plans and view the composite dose distributions and DVHs and the ability to export DVH data for analysis in 3rd party software.

Contractor Response. [redacted]	(E)



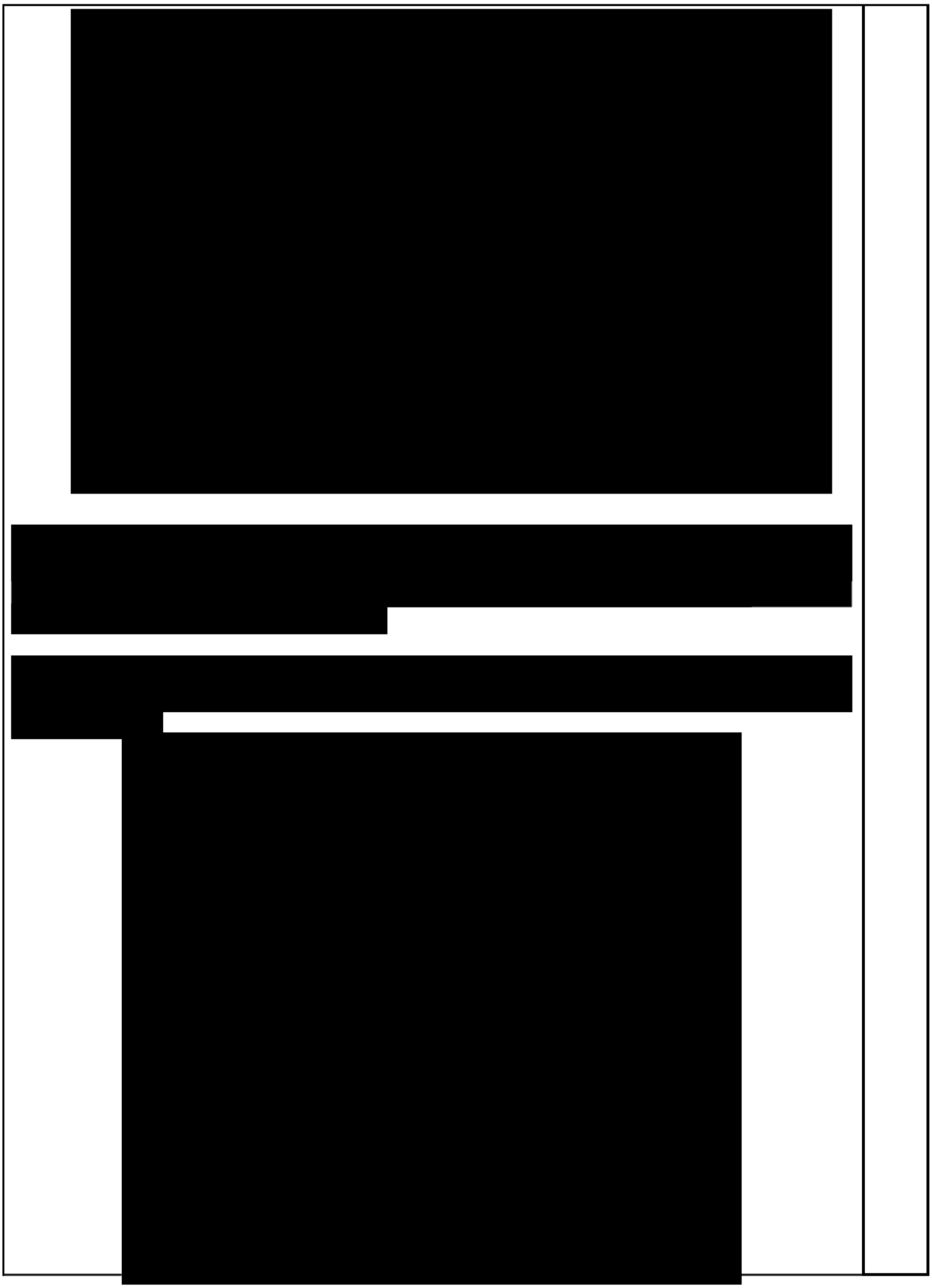


[redacted]

[redacted] Facilities for the display of beams eye views and calculation of digitally reconstructed radiographs (DRRs) should be available including optimisation based on tissue type, selection the tissue

depth included and the ability to specify all structures and other generated objects which appear in the view.

Contractor Response. [redacted]	(E)



[redacted]	

It should be possible to combine photon and electron beams on a single plan.

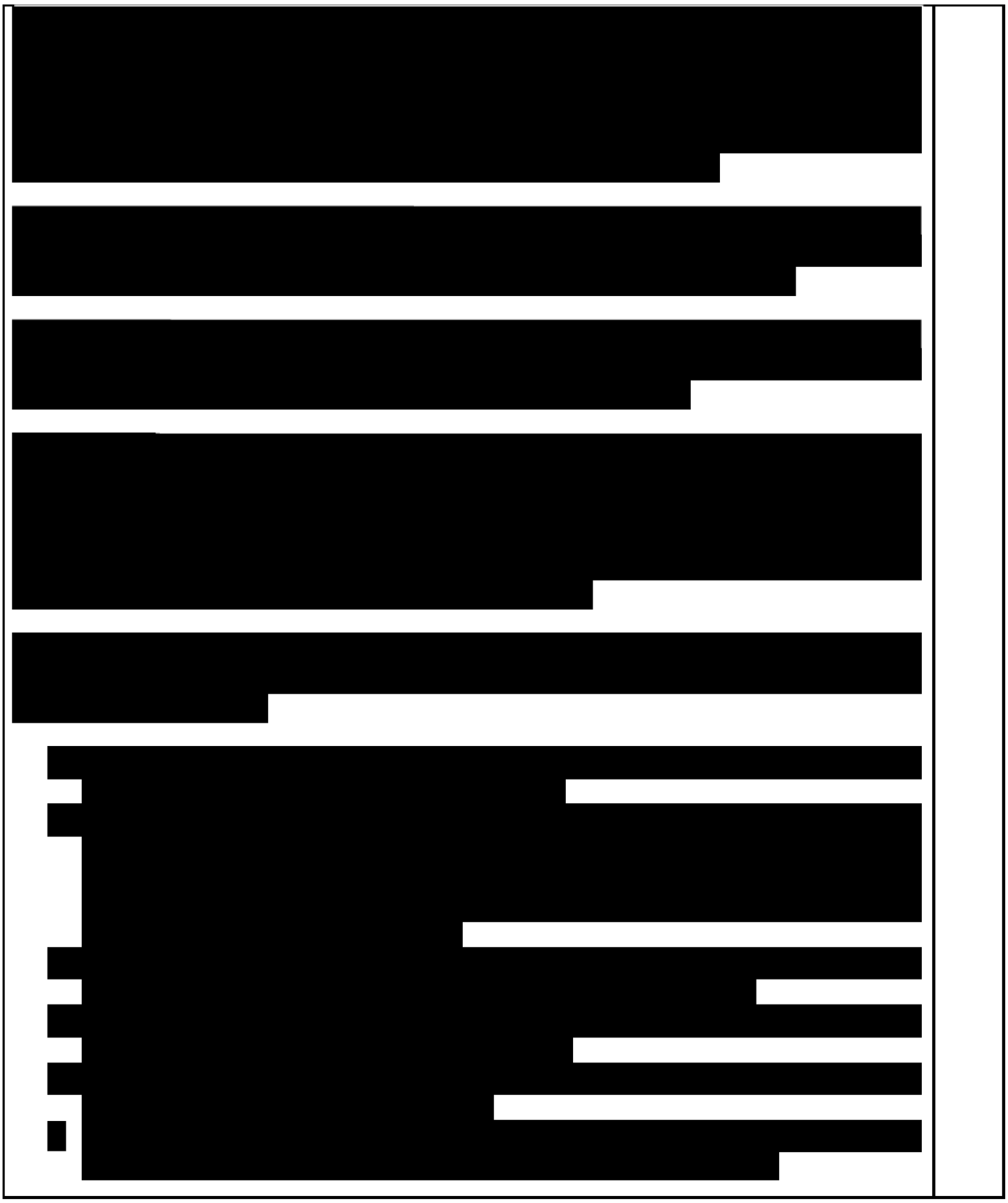
Contractor Response. [redacted]	(E)

The TPS should have the ability to model the effect of the treatment couch, including couch extensions on the dose delivered to the patient.

Contractor Response.	(E)
[redacted]	

The user should be able to lock the ROIs, treatment plan etc. from further editing by electronic signature.

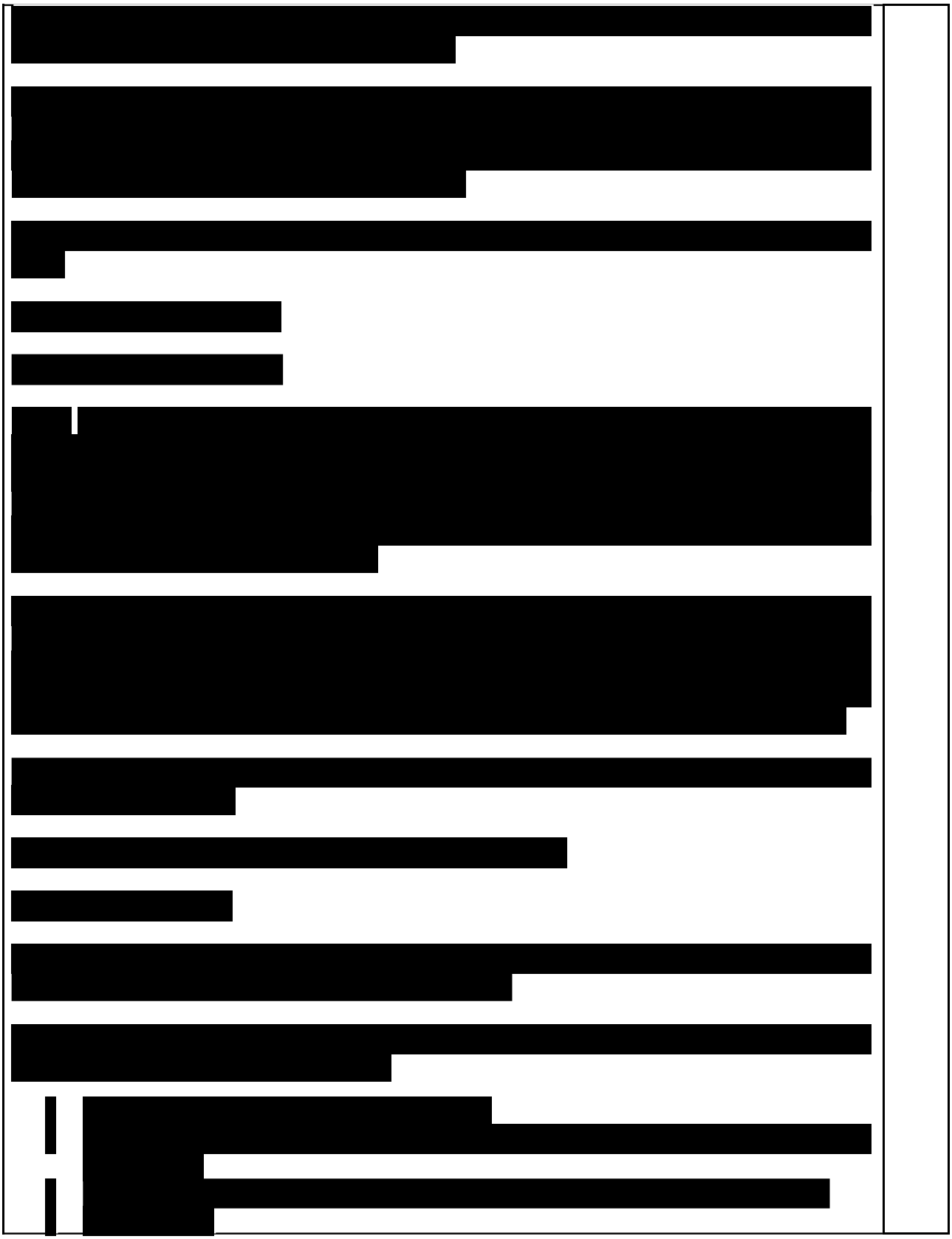
Details required as to how this fits into the workflow.	(E)
[redacted]	

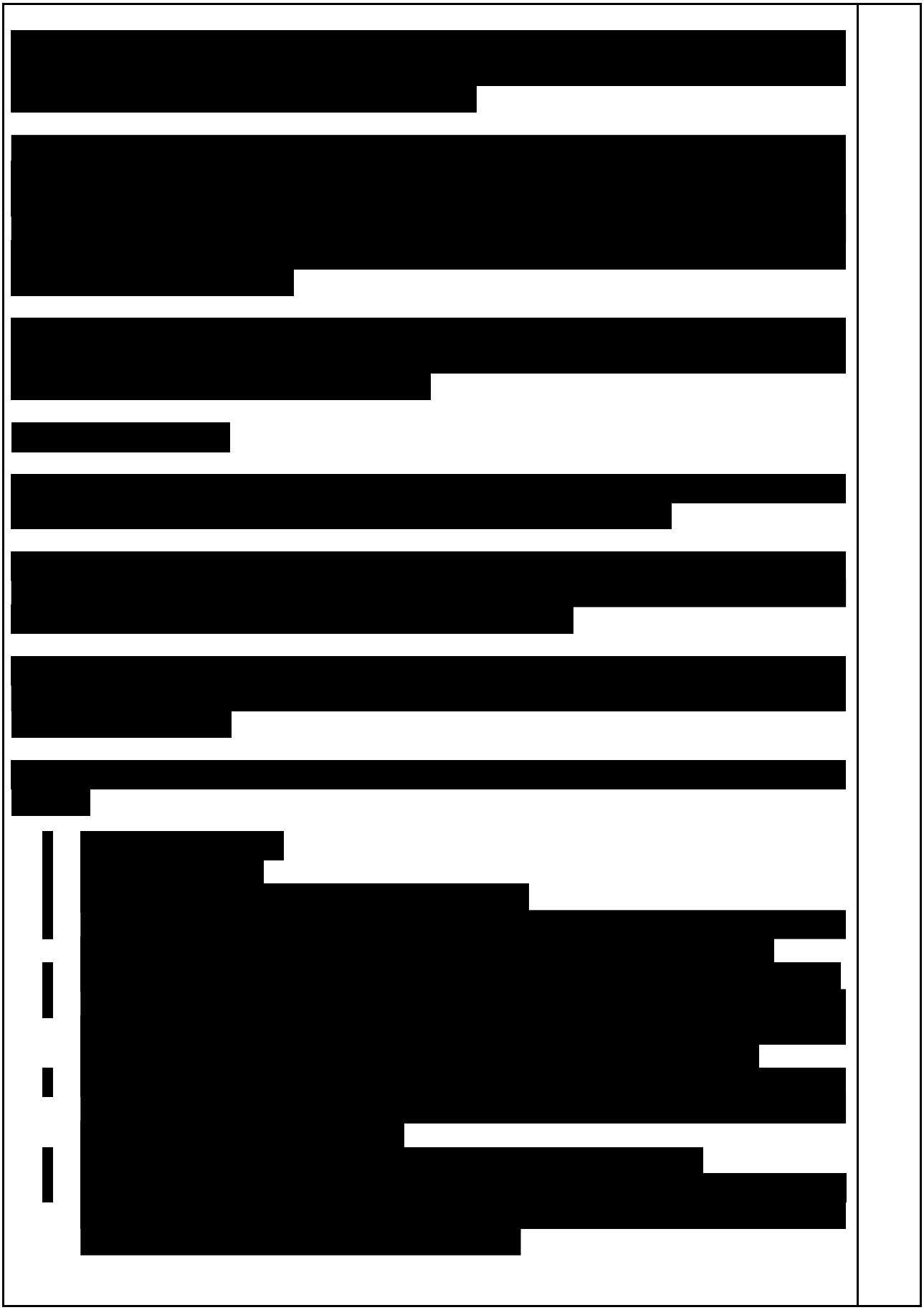


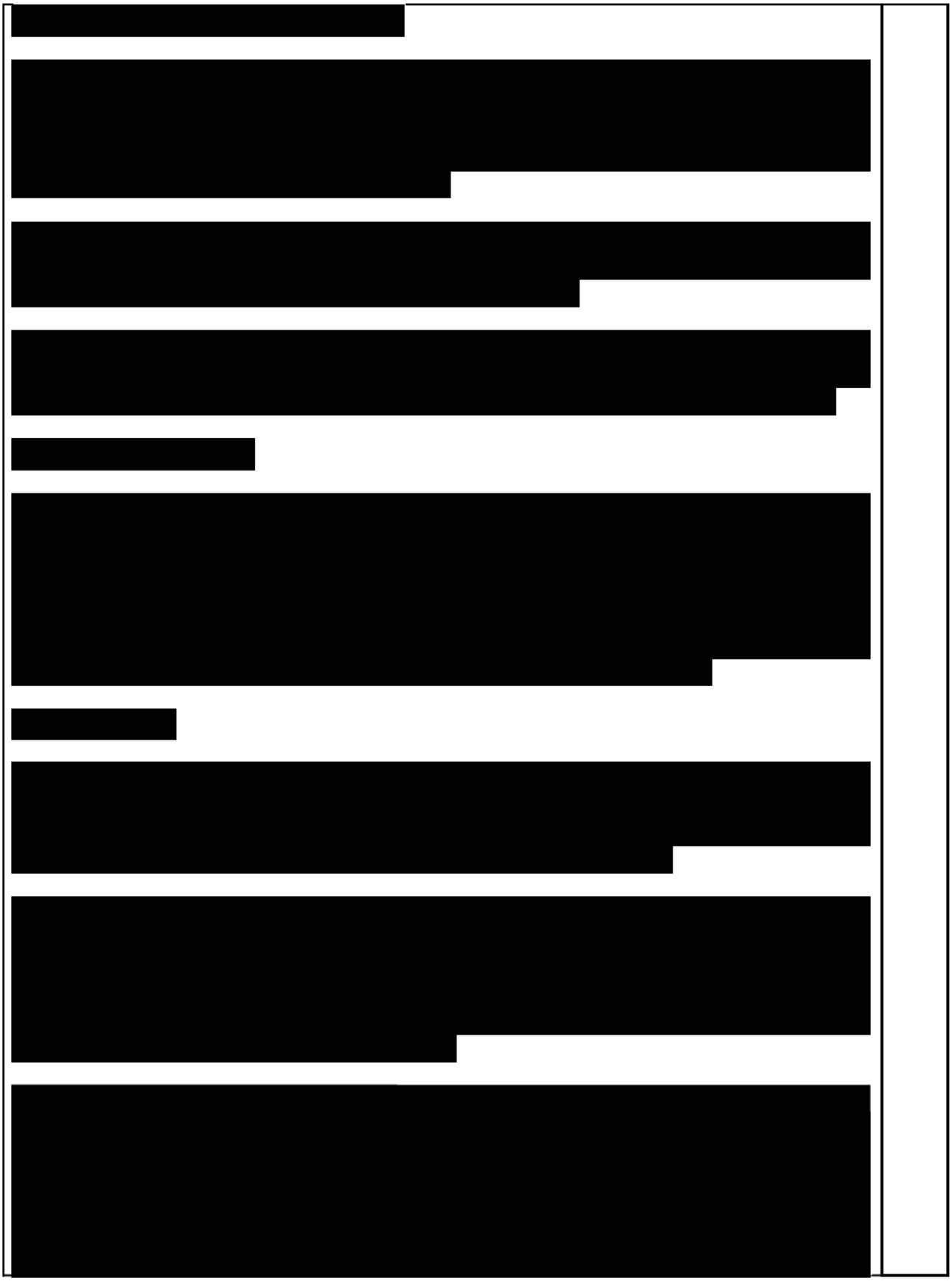
This should cover the whole range of planning, from palliative to the most advanced techniques. Our case mix is as follows: .....

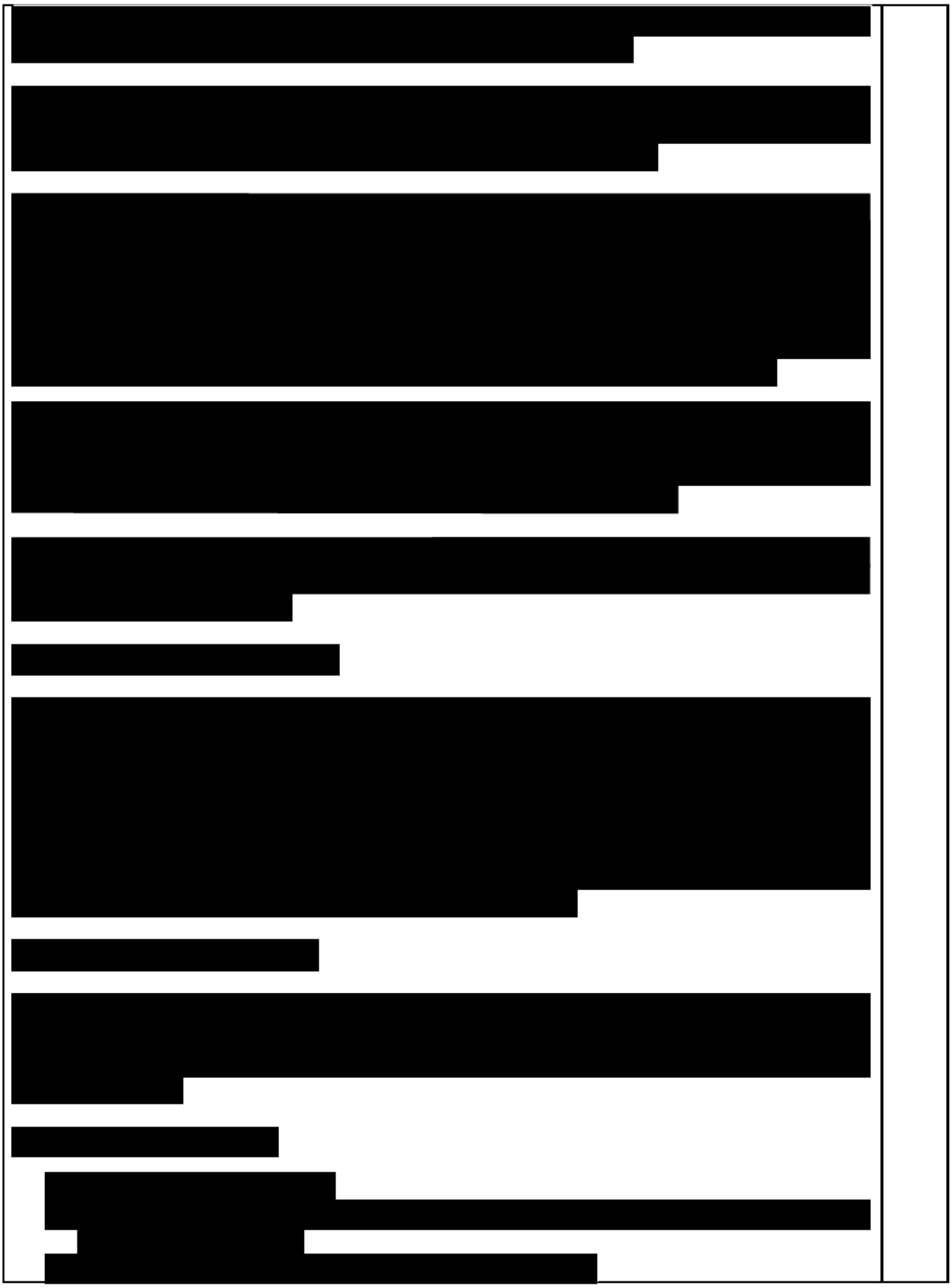
The vendor should describe how treatment planning is optimized for all cases.

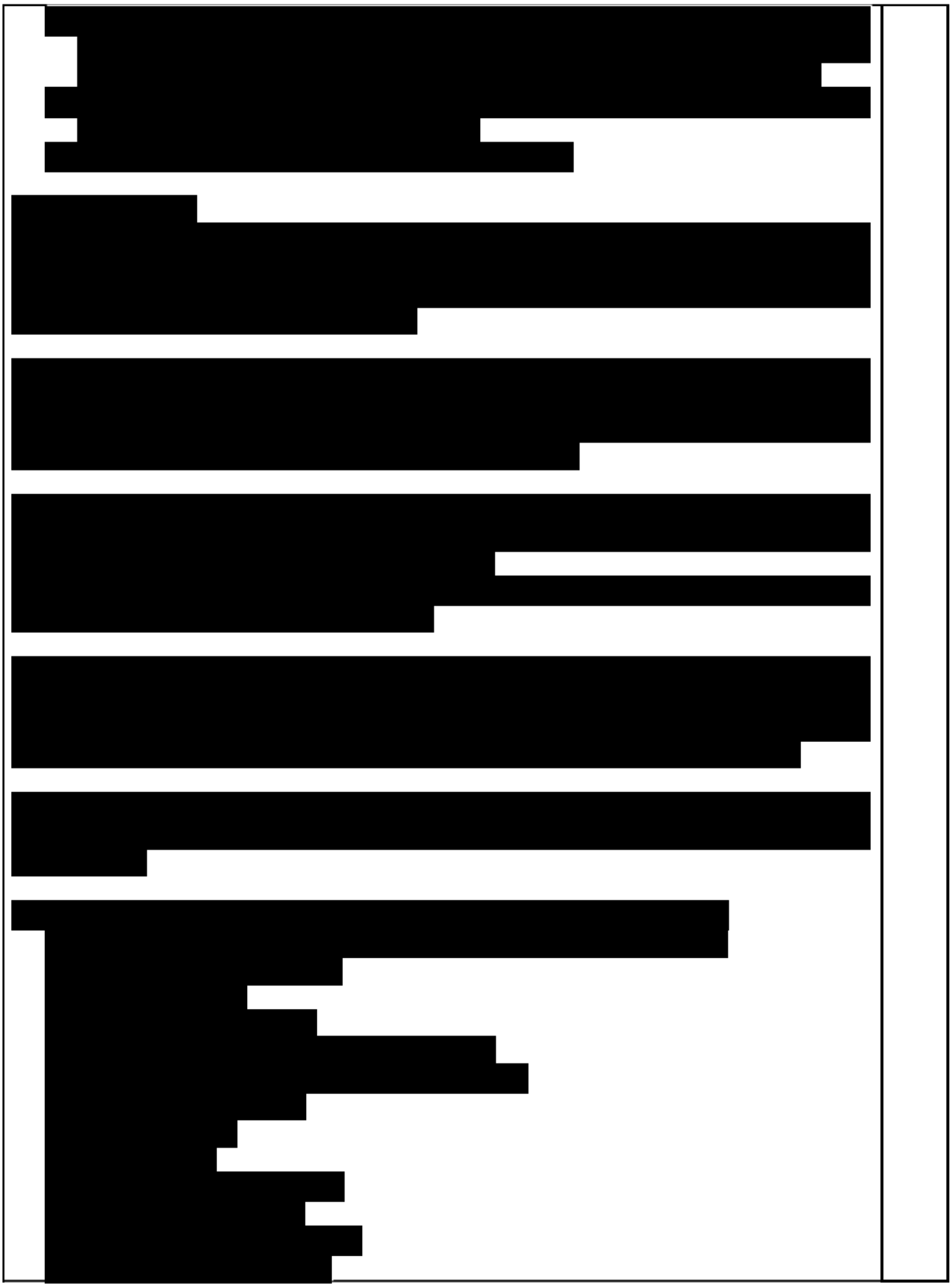
Please provide details: [redacted]	(E)

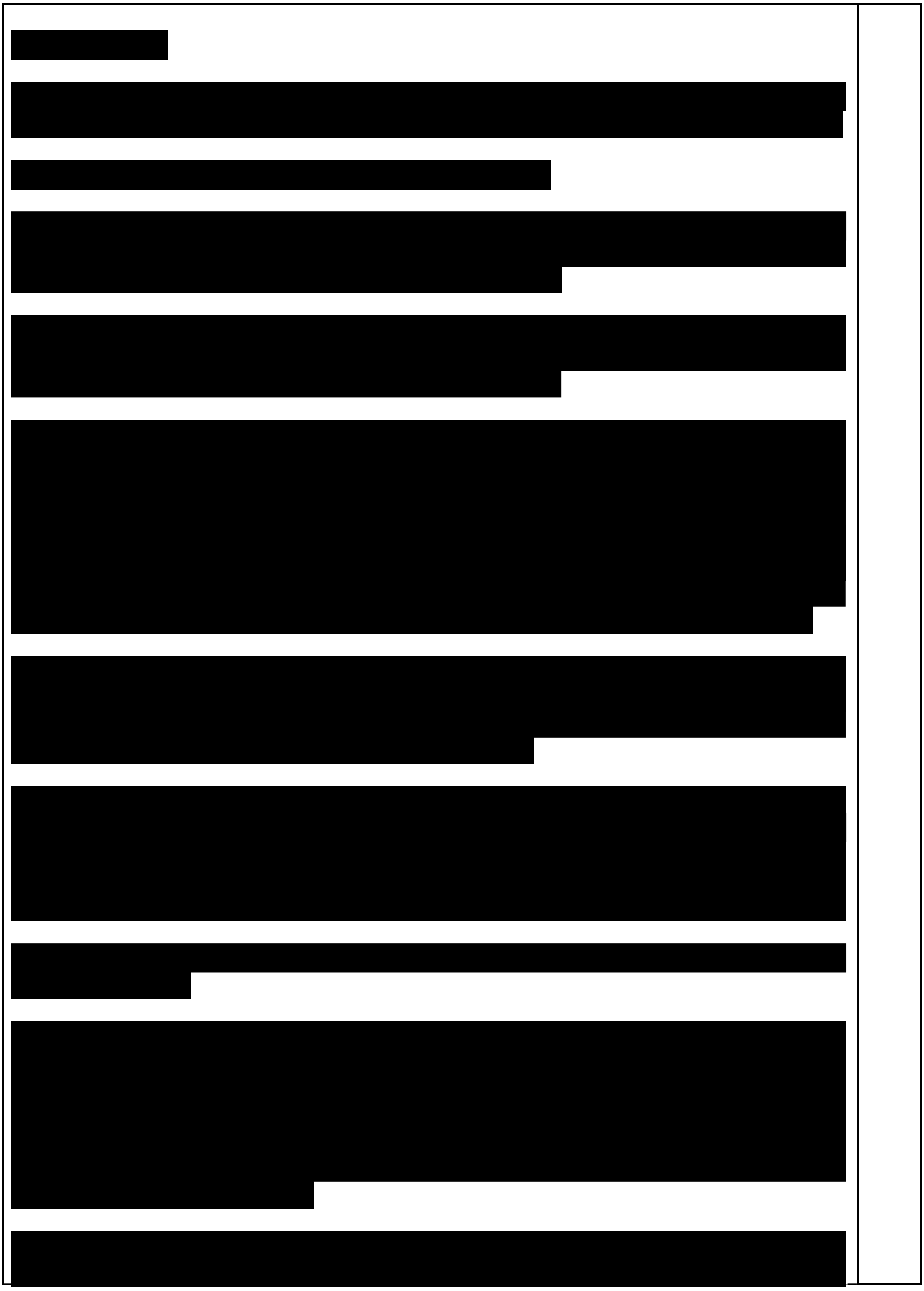


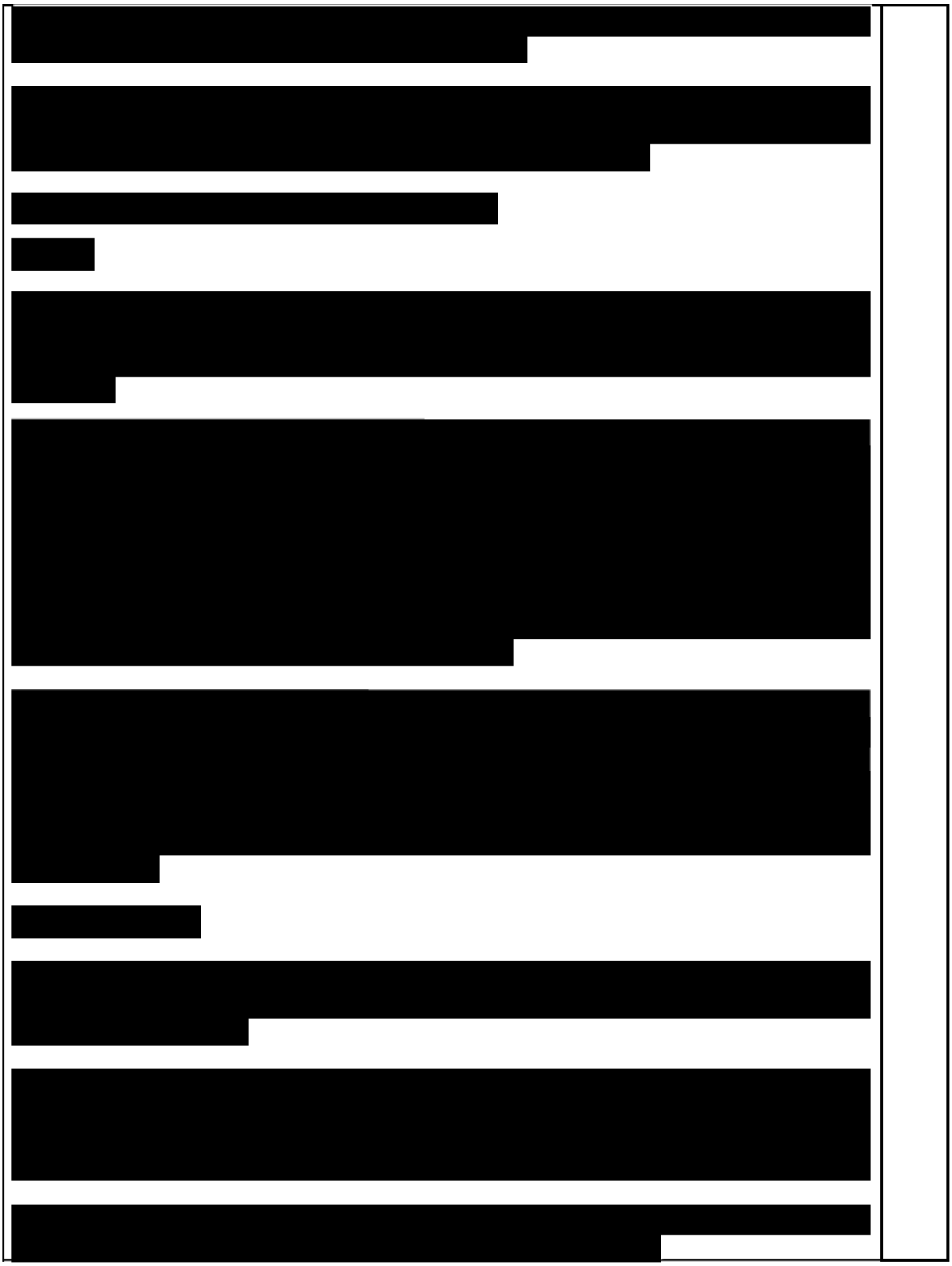


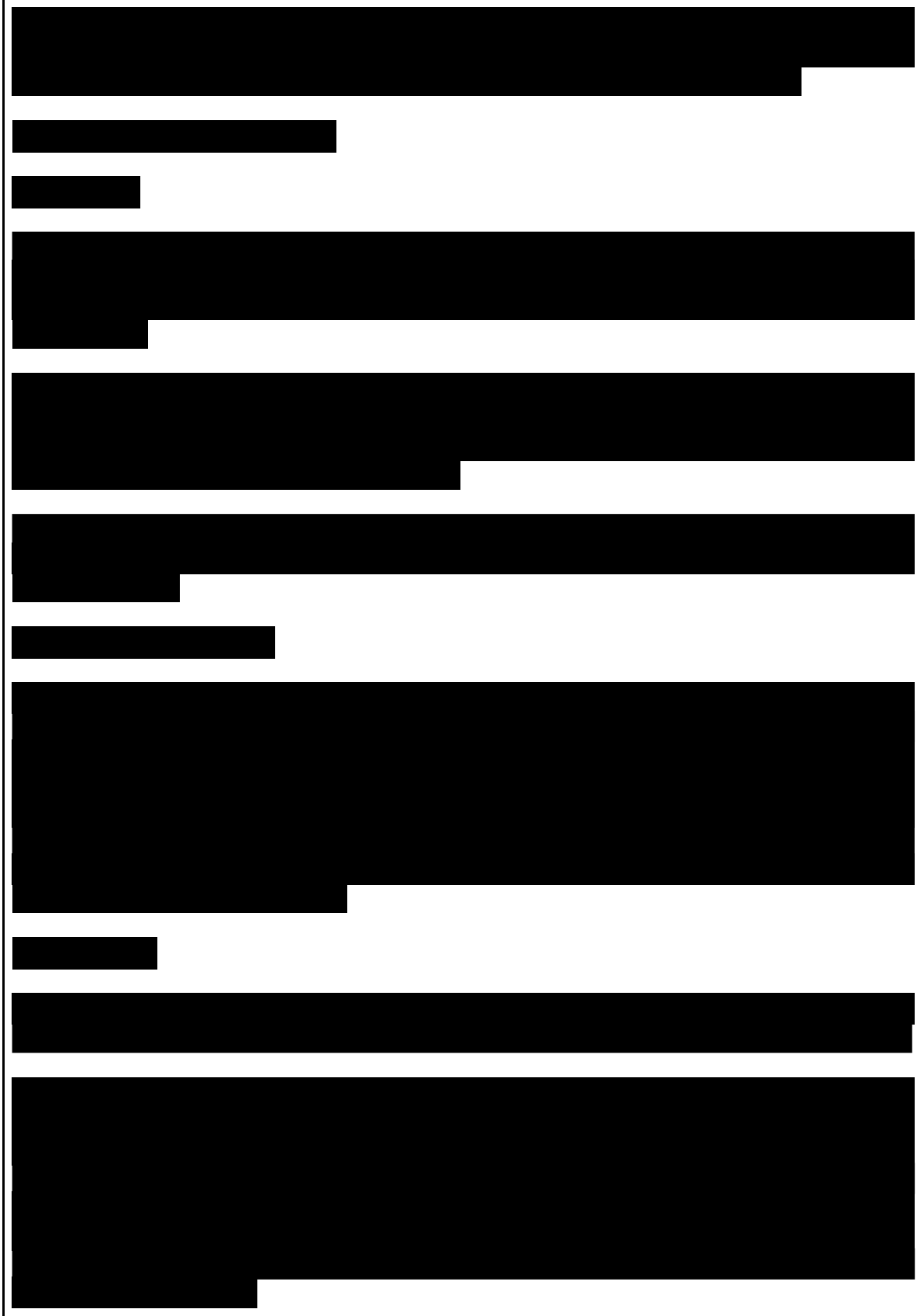










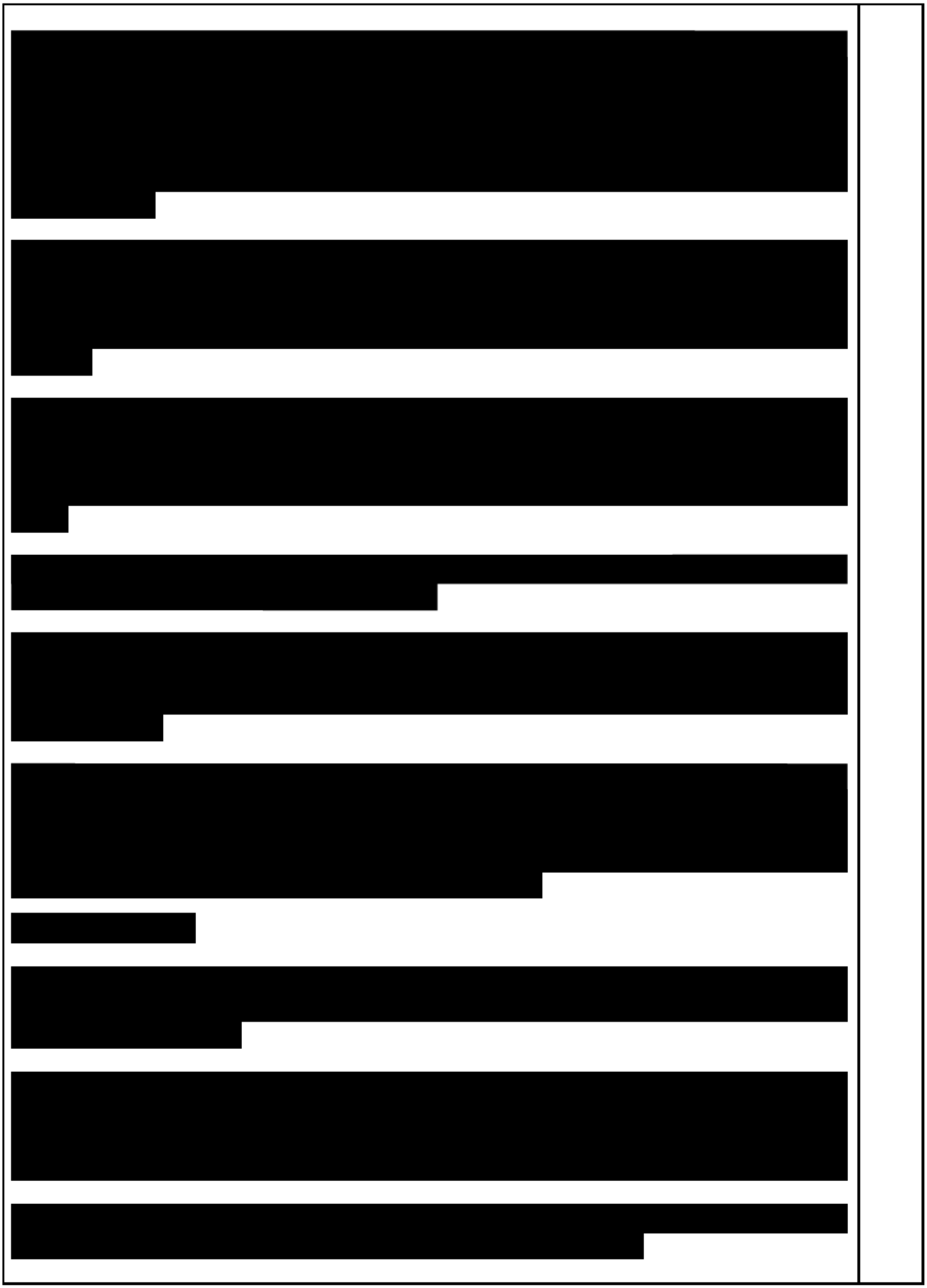


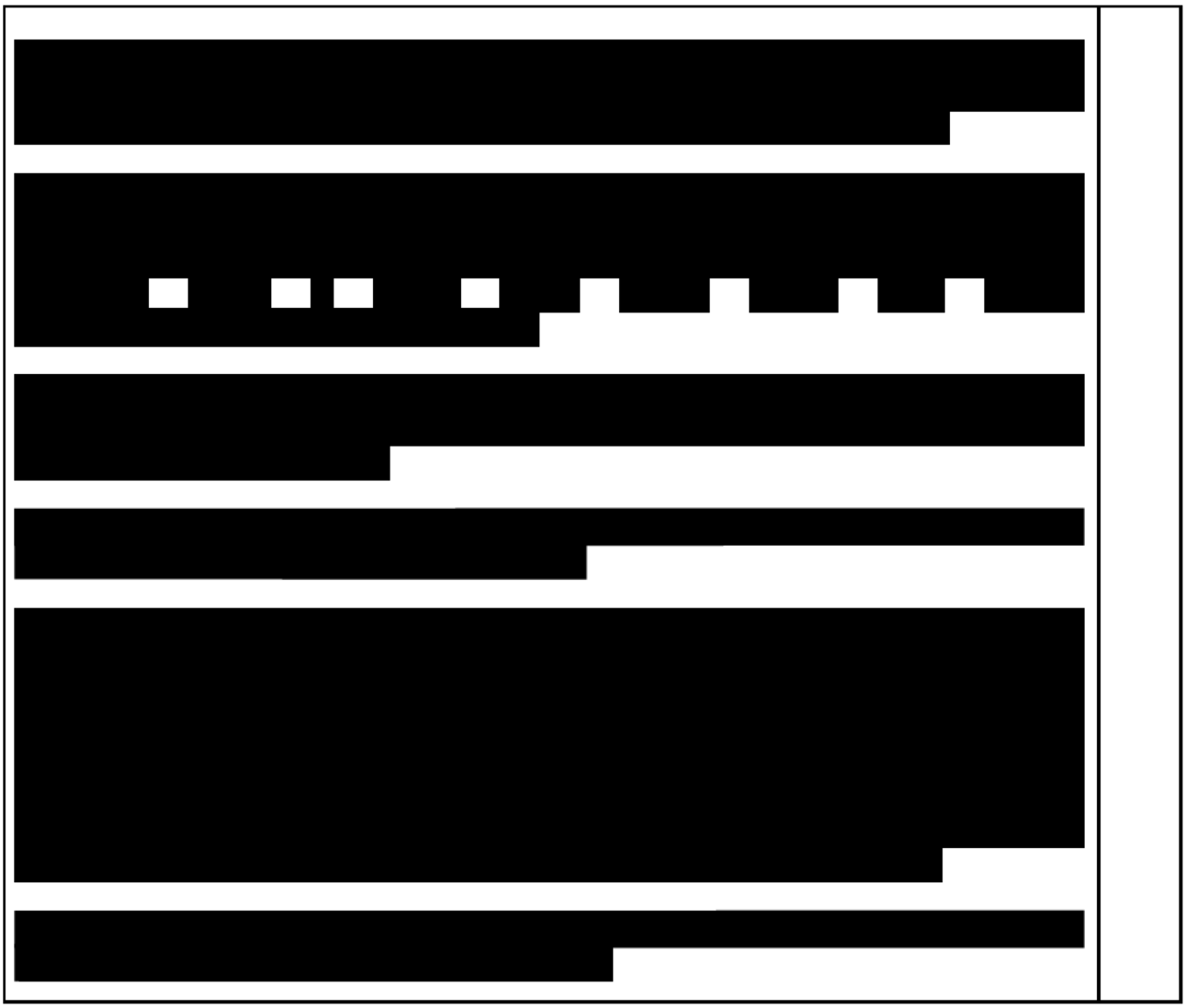
[redacted]

4.2.5 Algorithms & Optimisers

The TPS should provide photon algorithm(s) capable of modelling scatter and calculating dose in 3D CT data sets and phantoms, known as “type 2” algorithms. Please provide details of all the algorithms offered including calculation, display and plotted grid sizes. Please also indicate if the algorithm calculates dose to water, dose to medium or dose to water in the medium.

Contractor Response.	(E)
[redacted]	





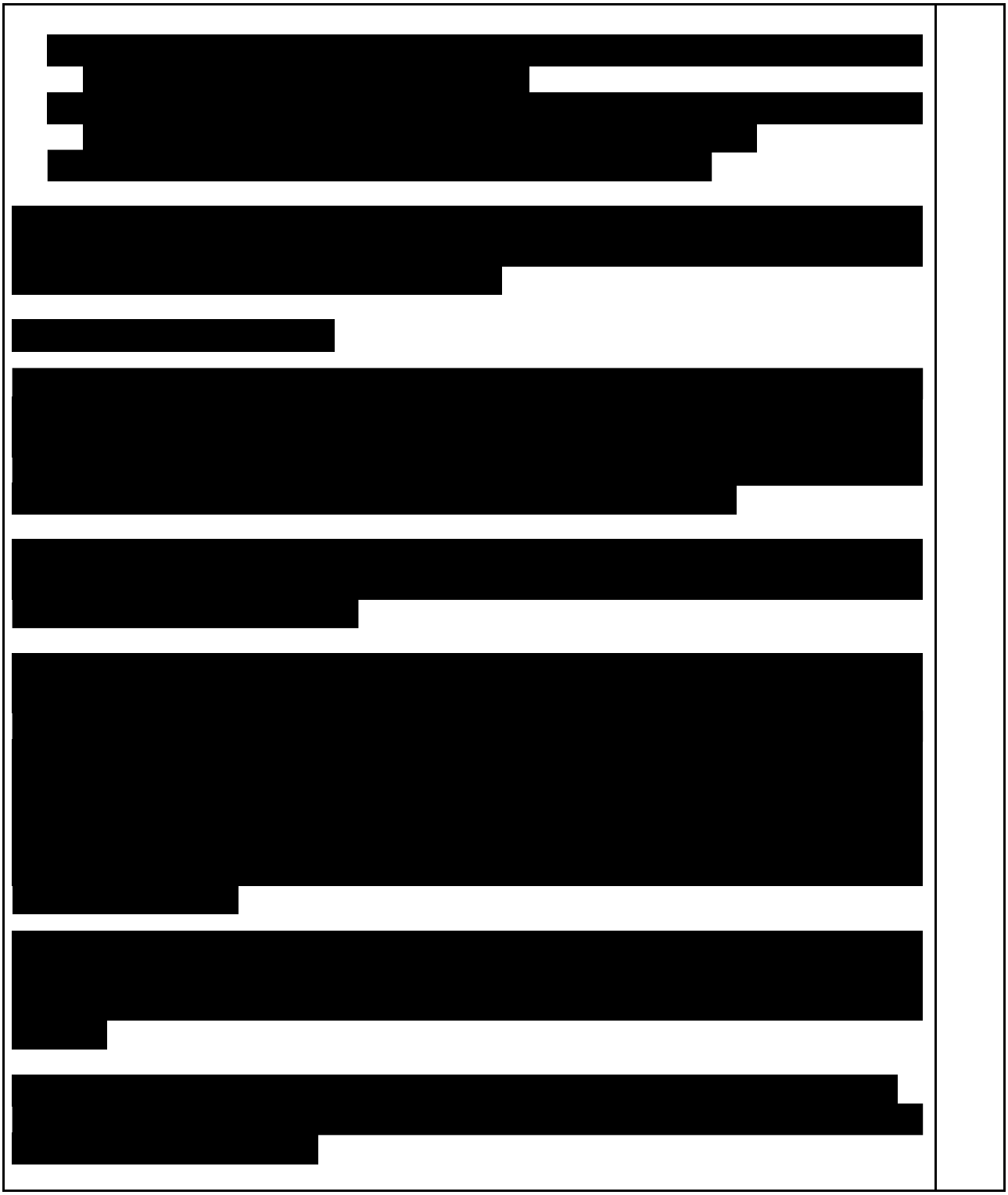
The TPS should provide electron algorithm(s) capable of modelling scatter, and of calculating dose in 3D CT data sets and phantoms. Please provide details of all the algorithms offered including calculation, display and plotted grid sizes. Please also indicate if the algorithm calculates dose to water, dose to medium or dose to water in the medium.

Contractor Response. (E)

[redacted]

Please describe the range of beam modifiers (metals and / or plastics) that can be modelled by both the photon and electron algorithms.

Contractor Response.	(E)
[redacted]	



[redacted]		

Please estimate how long the *calculation* of a 360° dual arc VMAT head & neck treatment with 2-degree control points and 100 CT slices would take. Provide evidence of this using one of our plans.

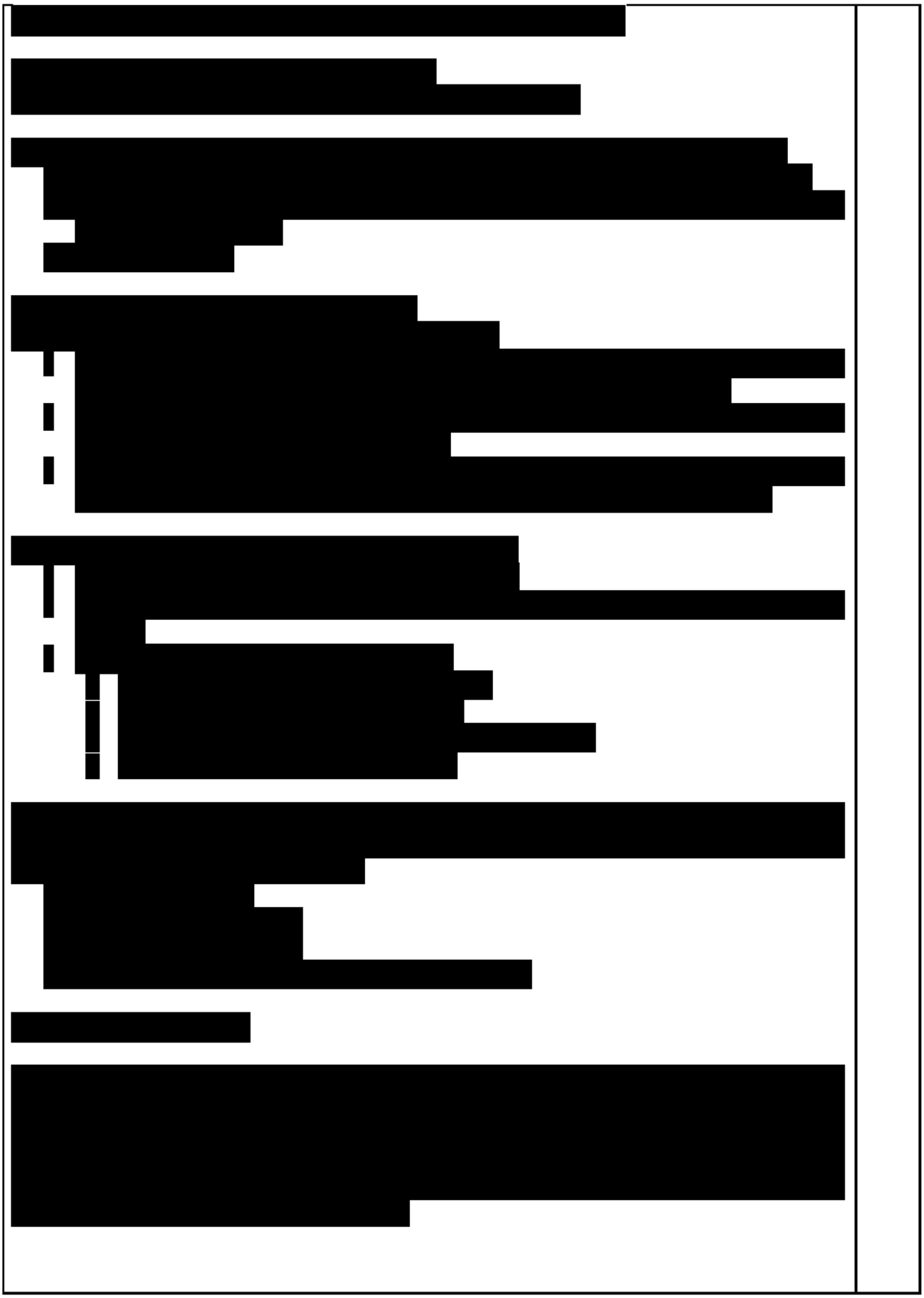
Contractor Response. [redacted]	(E)

[redacted]

It is desirable that the TPS provide radiobiological modelling tools. Please provide a description of the available functions and algorithms.

Contractor Response. (E)

[redacted]



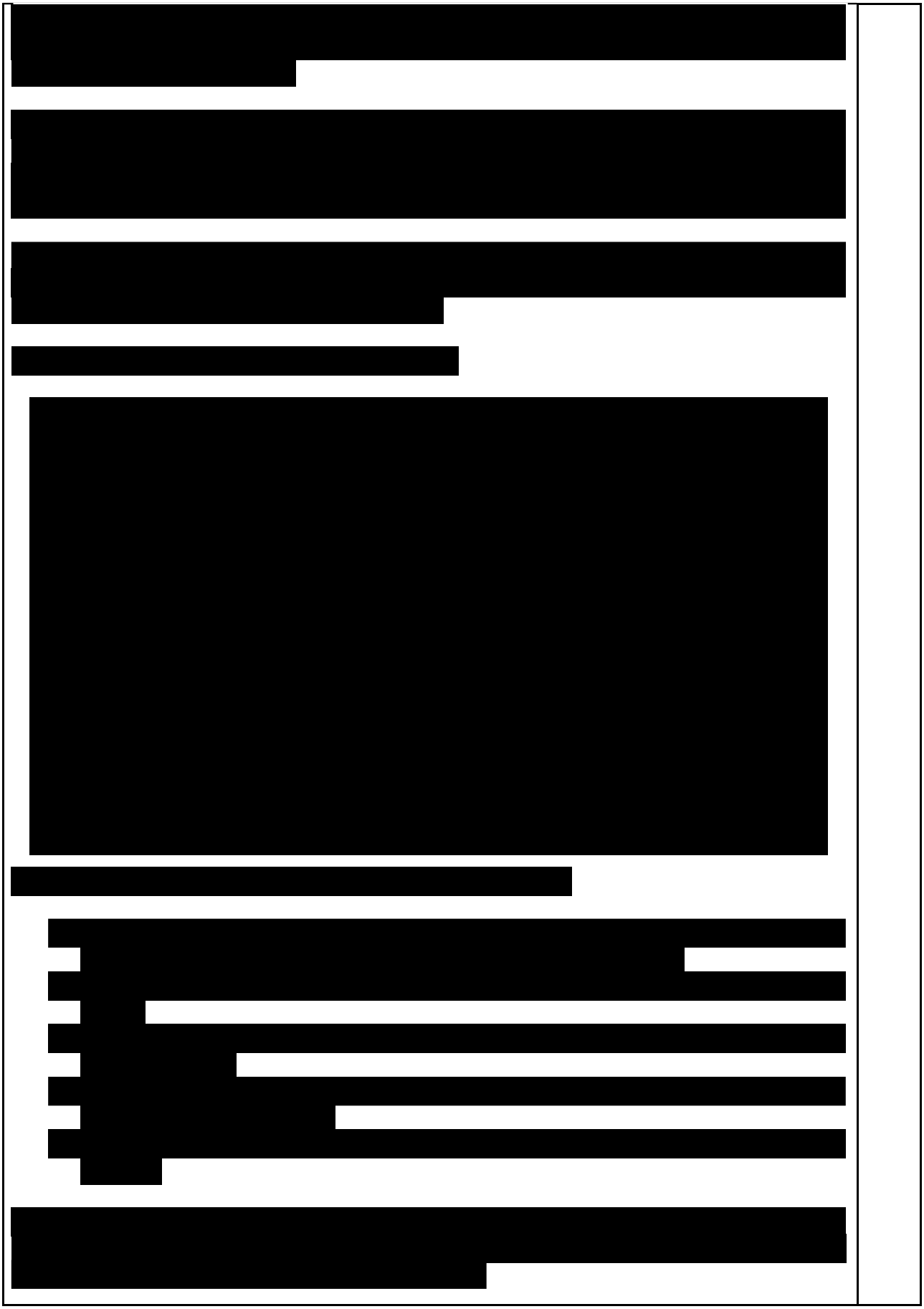
[redacted]	

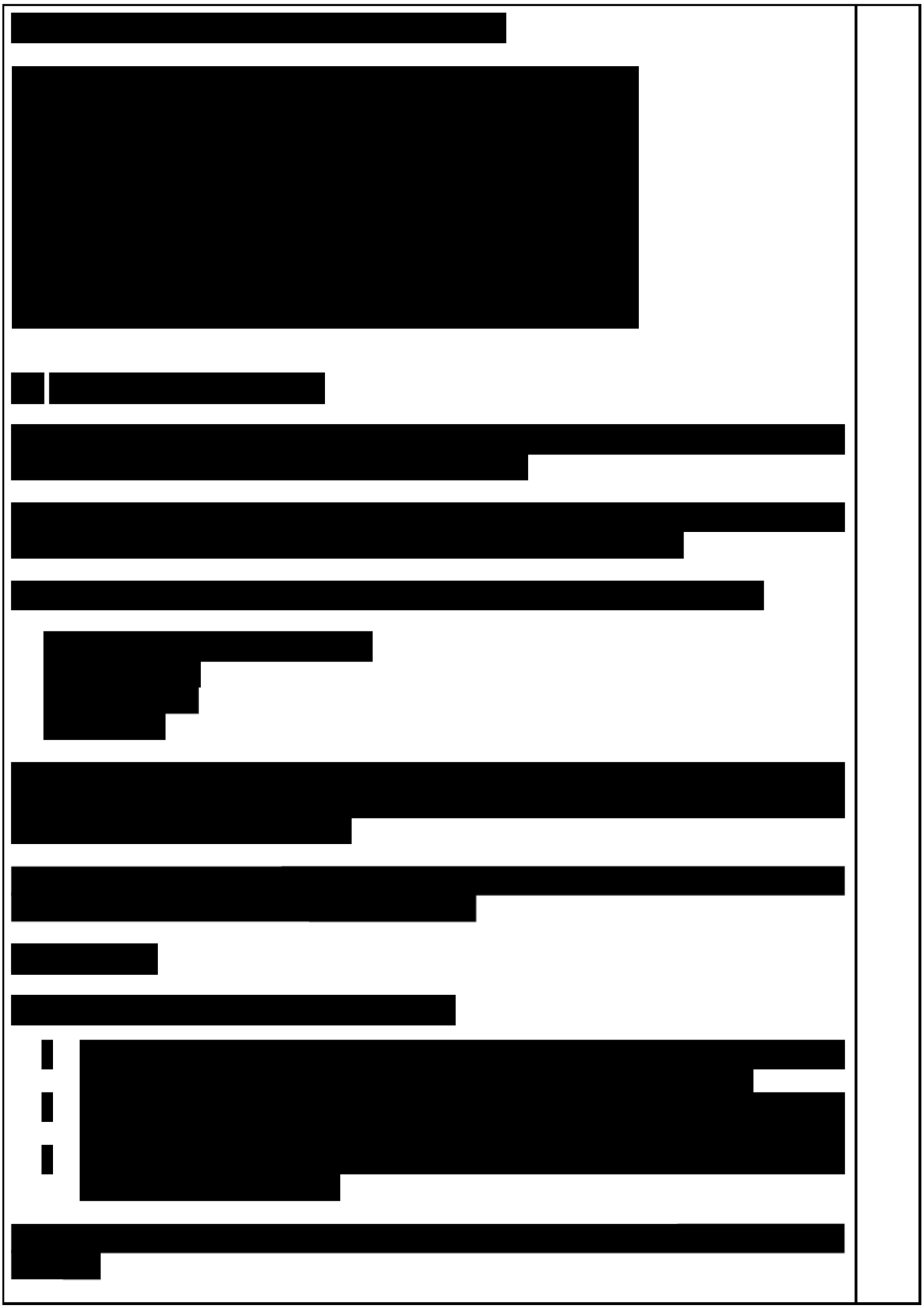
The TPS should have an optimiser which is capable of generating inverse planned step and shoot, sliding window and VMAT plans. The optimiser should provide maximum flexibility (including limiting optimization) for the user to define dose constraints and objectives in terms of:

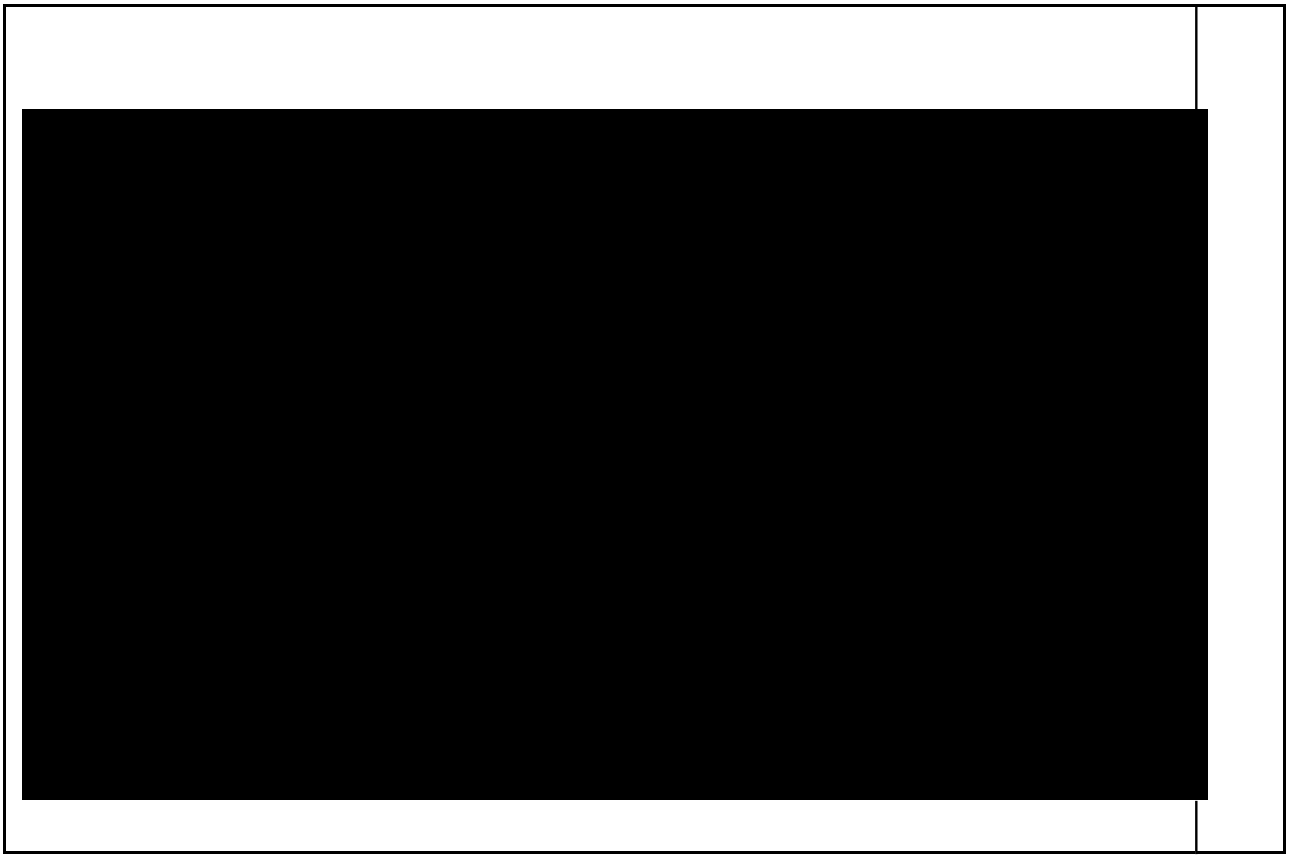
- Maximum and minimum dose to specified fractional or absolute volumes
- Dose uniformity and gradients
- Mean and median dose to specified volumes

Please provide confirmation and a description of the optimiser including the dose calculation algorithm it is using. [redacted]	(E)

[redacted]

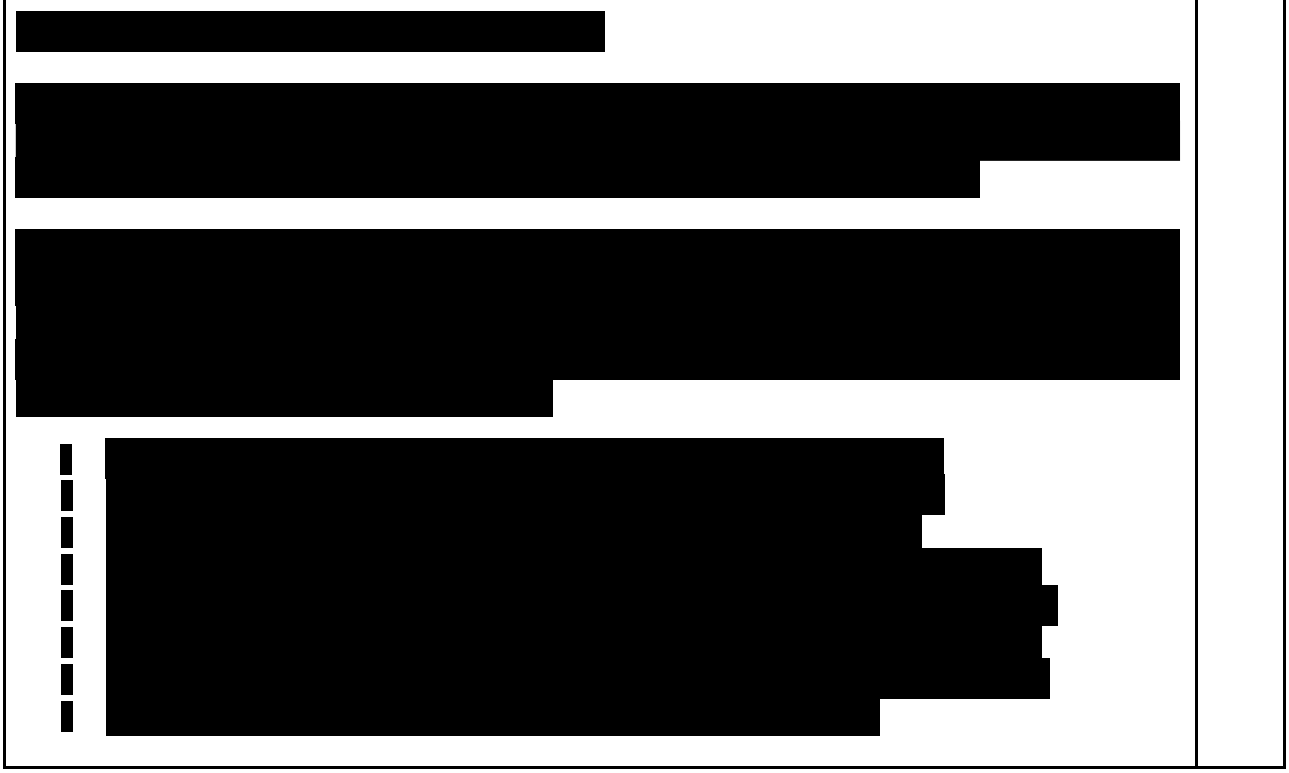


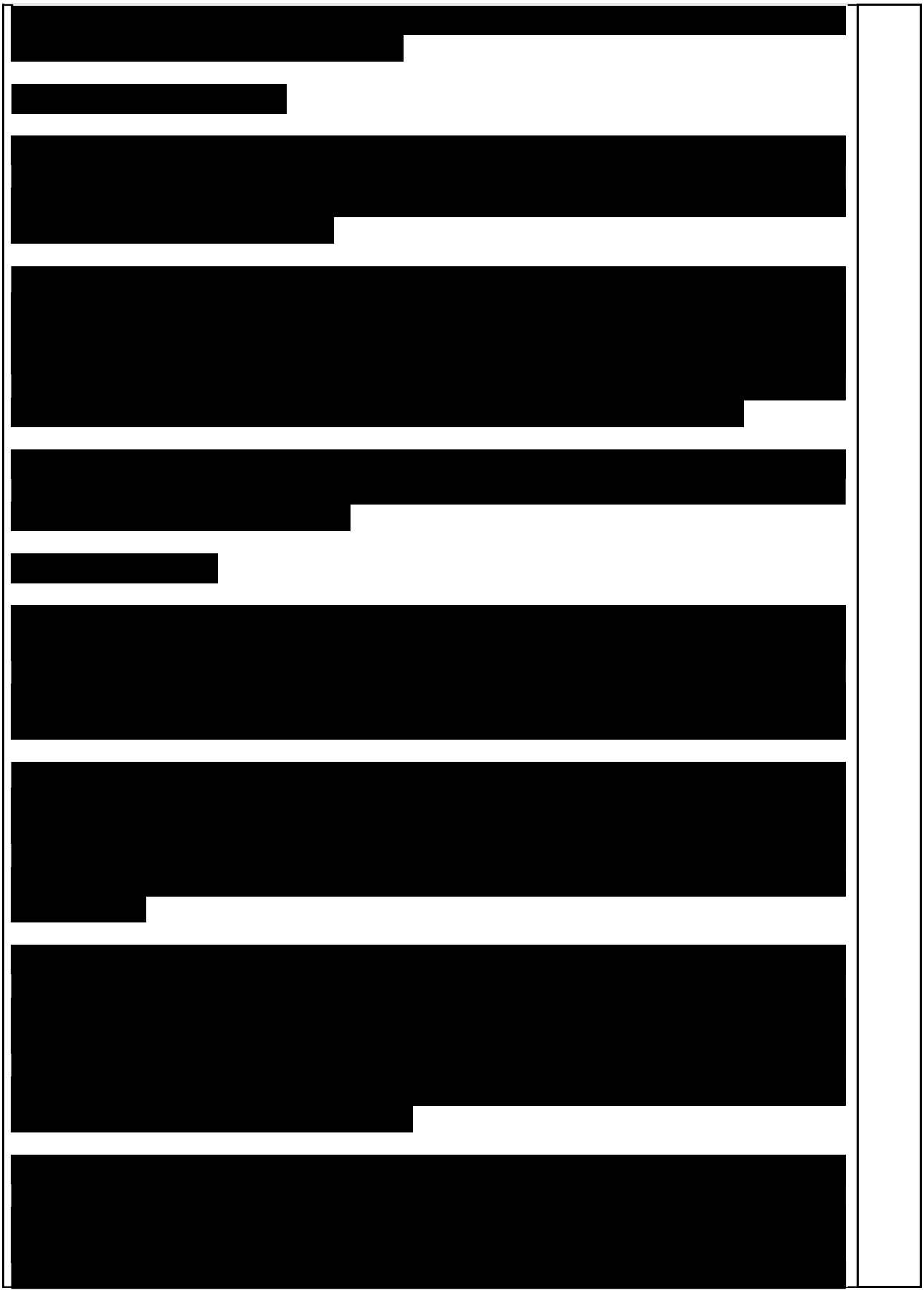


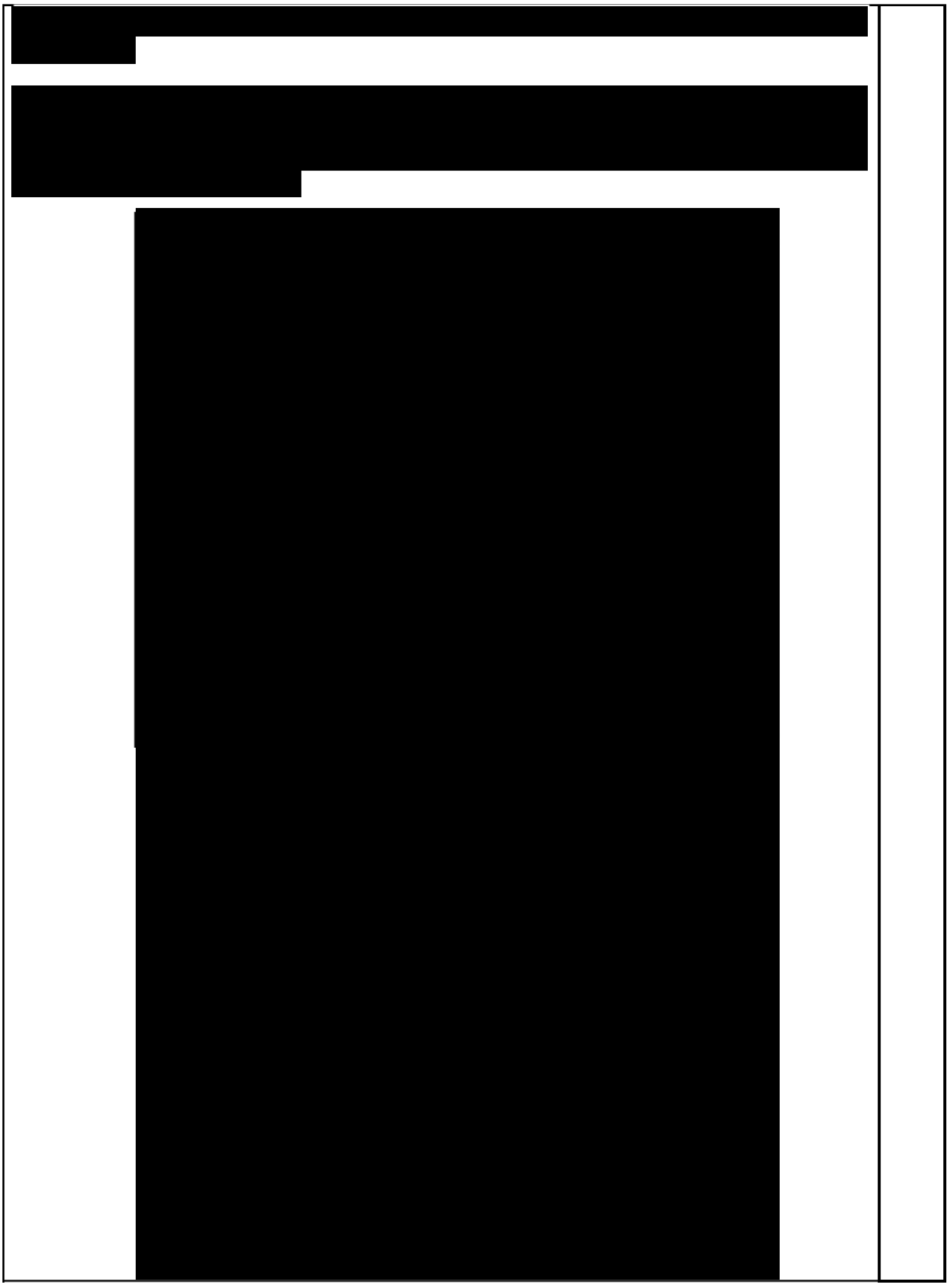


The TPS should facilitate optimisation of single arc, dual and multiple arc and partial arc plans.

Please provide confirmation. (E)

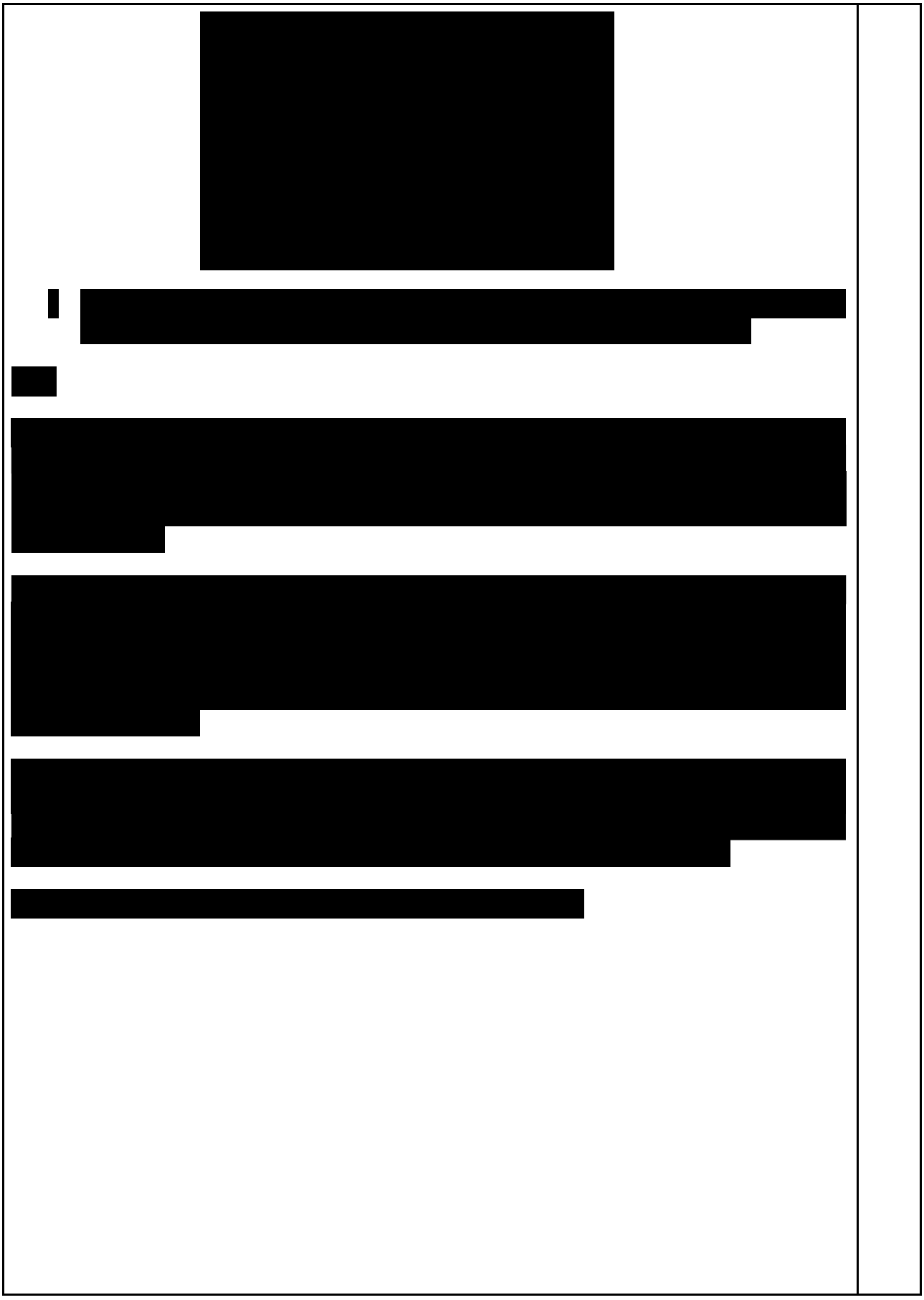


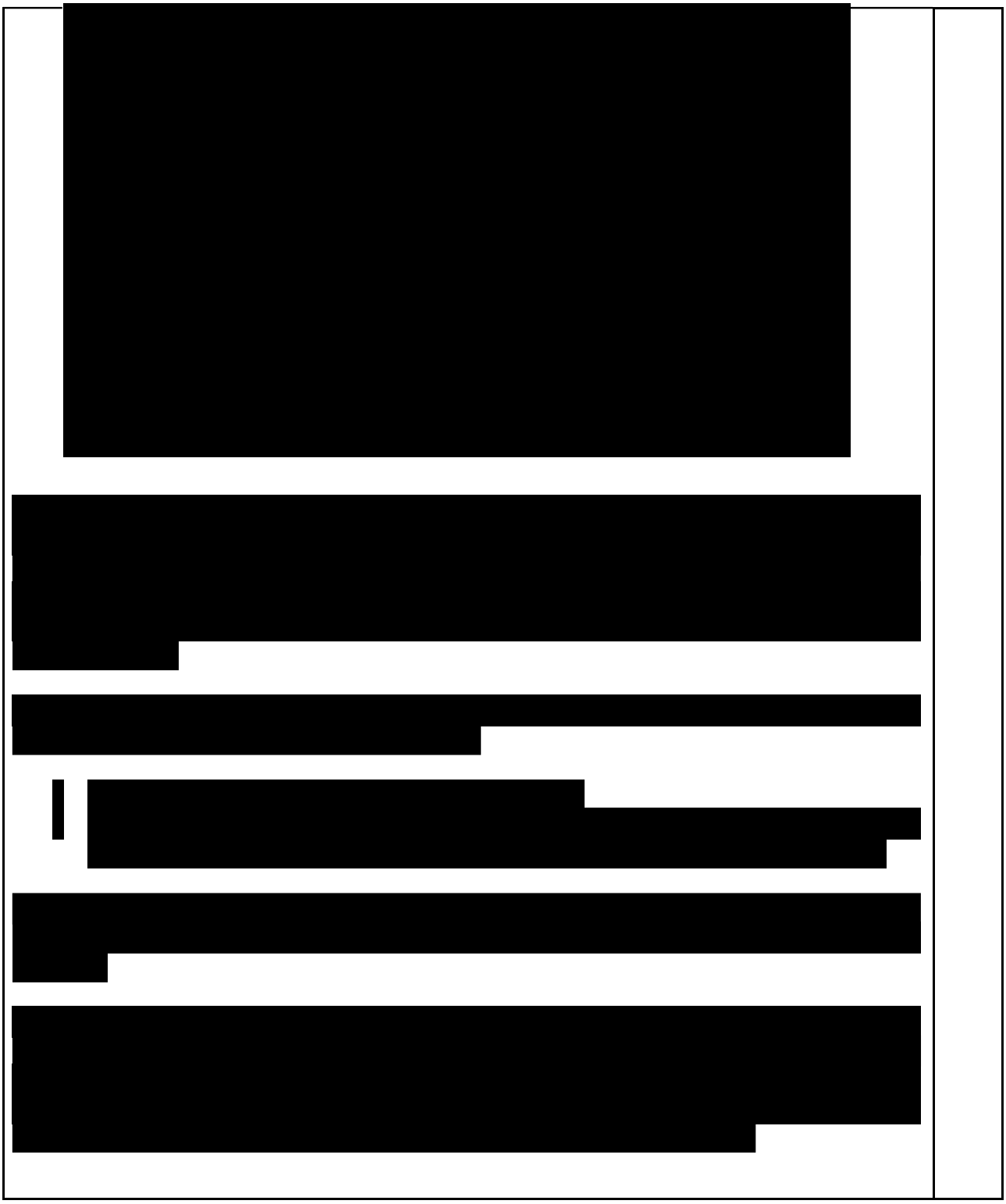


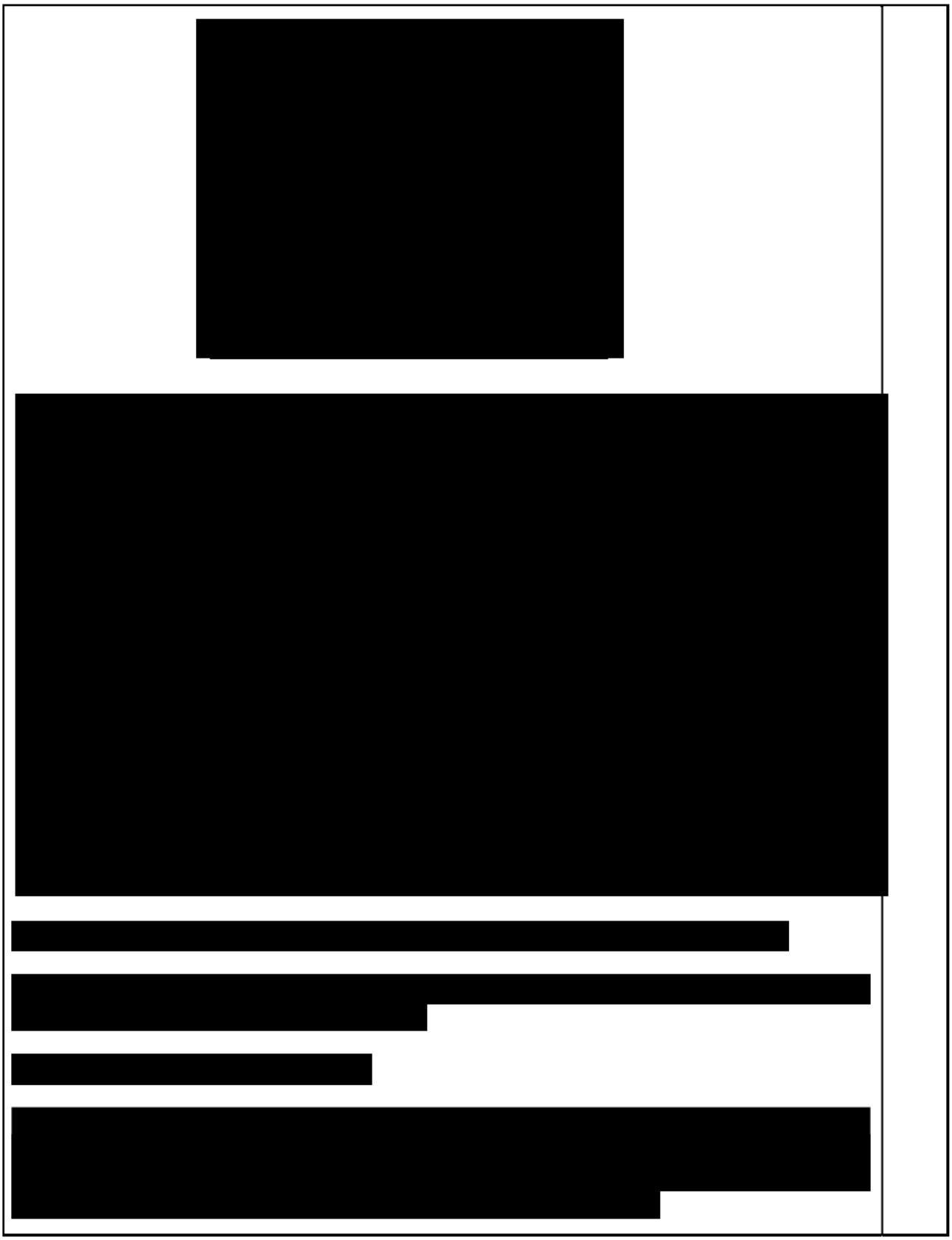


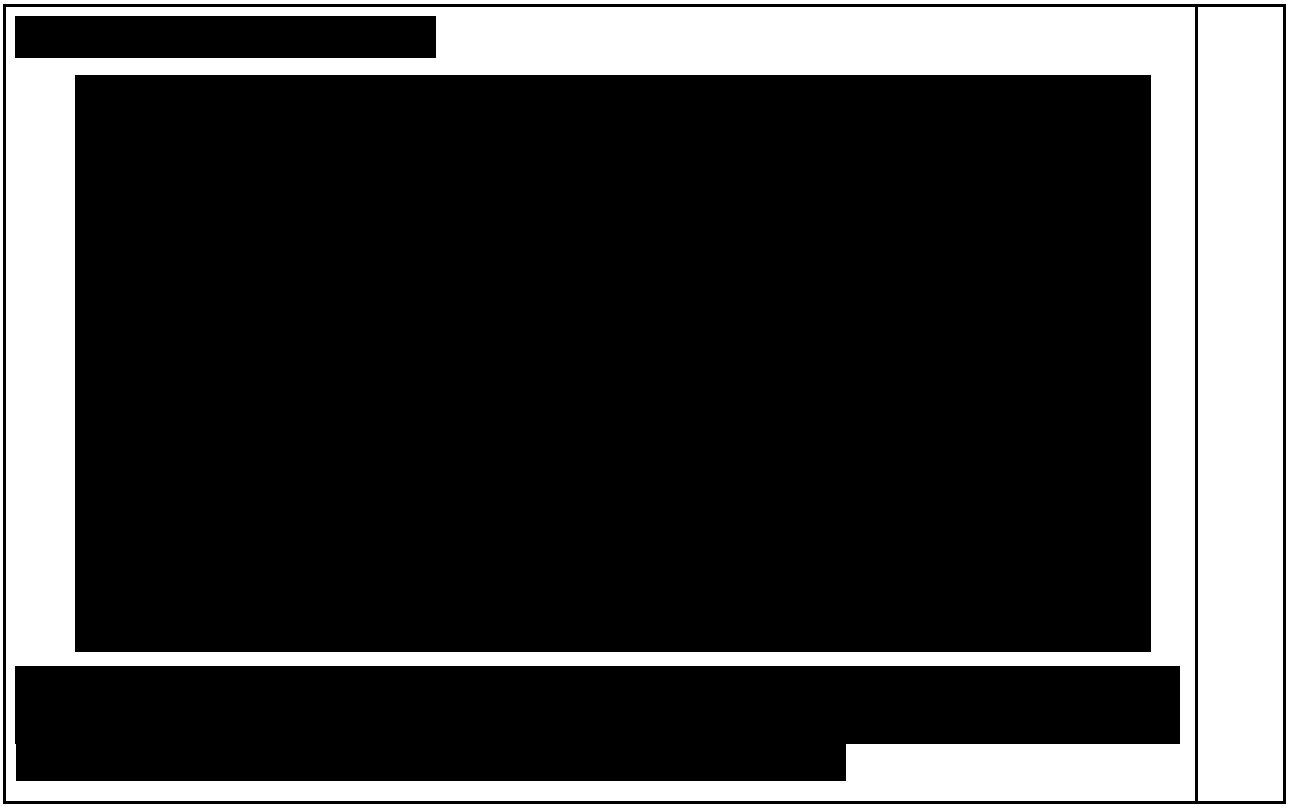
Facilities should be available to modify the objectives, constraints and ROIs both during and after optimisation in order to attempt further plan improvements.

Please describe use of tools available to achieve this.	(E)
[redacted]	









The TPS should permit dose calculations using patient-specific delivery plan with arbitrary phantom configurations and it should be possible to carry out an independent monitor unit calculation of all dynamic dose delivery calculations using the department's existing independent MU check software.

Please provide confirmation.	(E)

[redacted]

Please estimate how long the *optimisation* of a 360° dual arc VMAT head & neck treatment with 2-degree control points and 100 CT slices would take. Provide evidence of this using one of our plans.

Contractor Response.	(E)
[redacted]	

[redacted]

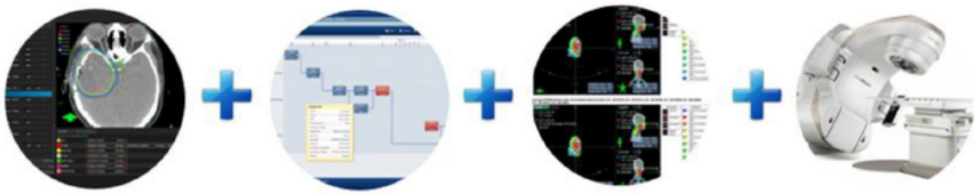
4.2.6 Advanced Planning Tools

The TPS should be able to facilitate rapid replanning in the event of changes in the patient to support adaptive radiotherapy planning. Please describe the support offered by the TPS for adaptive techniques including the ability to plan on CBCT data, facilities to simulate "as treated" treatment position by the use of rigid body transformations etc. A description of the adaptive workflow should be given, including how it is triggered, how it is done and how quickly it gets done.

Contractor Response. (E)

Yes – Eclipse and Velocity are fully compliant with this request.

Varian® is well positioned in adaptive therapy and can provide clinical teams with everything required for the adaption of the patient from the treatment machine, oncology information system, treatment planning software, and deformable capability to be successful in precise and personalized planning.



To further complement Varian's treatment planning portfolio, Velocity™ was added to specifically address a clinician's imaging needs. As more modalities and advanced imaging on the treatment machine becomes available, a need for a clinician lead platform was identified. More than ever clinicians need tools to connect, compare, analyse and understand the data that

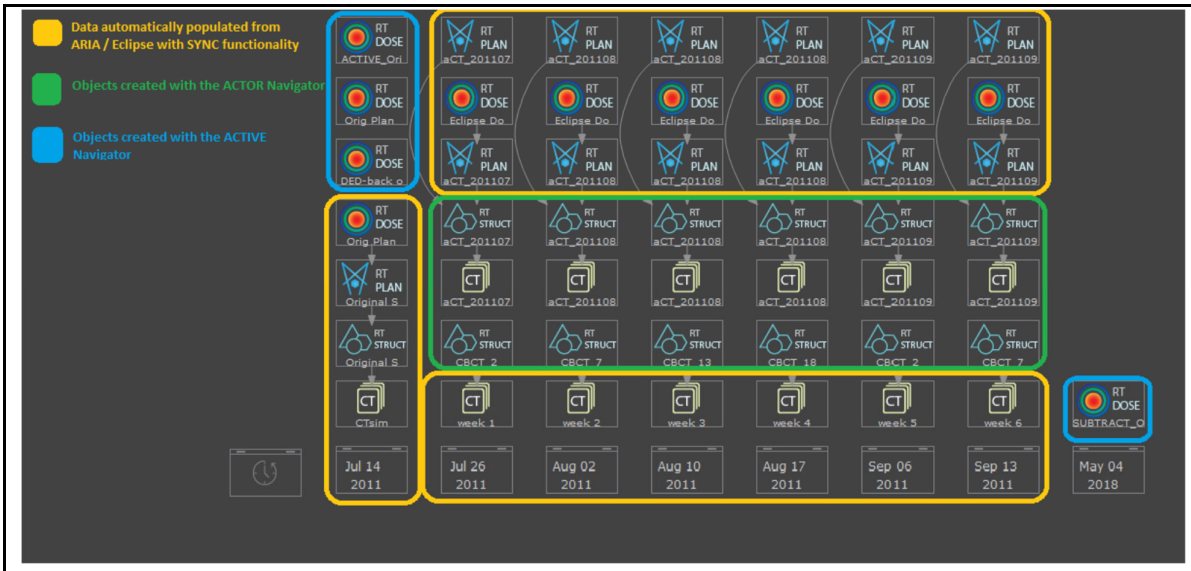
comes from many different sources over a patient's lifetime medical history. This is particularly true with adaptive radiotherapy today.

This product provides a radiotherapy specific vendor neutral imaging platform which aggregates image data from a wide variety of imaging modalities, planning systems and devices. As a result, clinicians are able to build a longitudinal patient history that is image driven and allows clinicians to visualise tumour response following treatment and support better decision making. In combination with ARIA, Eclipse and the delivery systems, the dose accumulation features of Velocity provides a strong platform for adaptive planning, which supports better clinical decisions. The infrastructure on which Velocity sits is integrated into the ARIA/Eclipse platform and provides remote access to the clinician wherever and whenever needed. These features include multi-modality image registration tools which allow the user to register CT, CBCT, PET, SPECT, MR, and RT Data for viewing and analysis. As Velocity is a vendor neutral RT archive, it can store all DICOM / DICOM RT files, which are displayed in a timeline view. This timeline view includes data that is synchronized from ARIA/Eclipse and is displayed in an easy to view patient map, making the complicated data easy to read. Velocity has dose tracking capabilities which allow the user to track the dose during a course of treatment and between courses of treatments. This dose can be mapped from previous plans and may be incorporated into decision making with a new treatment plan. Navigators, a Velocity assistant tool, are included in the software which facilitate and automate frequently used workflows, such as image registrations and dose summations, thus easing the burden on the clinical user.

The algorithm used in Velocity is an elastic B-spline algorithm and mutual information as the cost function metric for matching and aligning the tissue anatomy. Velocity's elastic approach aims to mimic natural soft tissue movement and maintain anatomical integrity. This includes constrained regularisation which prevents unnatural behaviour such as voxels jumping over each other, limiting the number of large magnitude errors and creating a fusion with a smooth deformation vector field. The registration matrix can be exported as a binary deformation field (BDF) file for research and clinical validation.

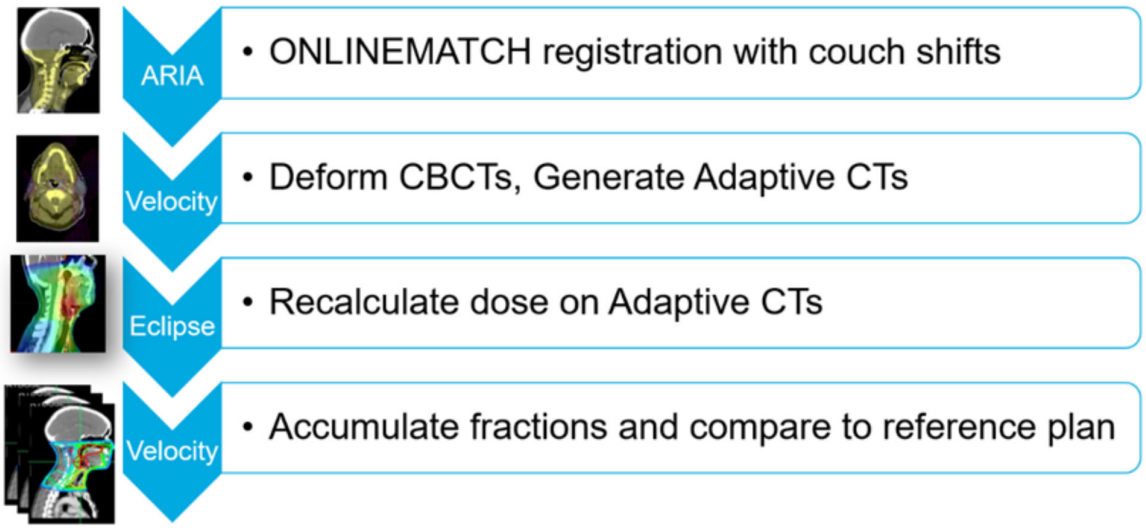
The deformable algorithm is applicable to both images and dose objects alike, performed manually or completely automated through the built-in adaptive navigators described below as part of an adaptive radiotherapy course.

Together with Eclipse/ARIA and Varian treatment machines, Velocity allows clinicians to evaluate delivered dose given new anatomy as well as integrate pre and post treatment imaging to assess response therapy to previous treatments.



Overview of the Off-Line adaptive Process

Using the Varian® software solution for offline review, the user does not need to change their workflow as all planning will still be done in the Eclipse™ treatment planning system. ARIA provides image storage, plan approval and treatment details. From the linear accelerator the table shifts, and treatments records are obtained. This includes the rigid registration in the 'treatment position'. In addition, Velocity provides the deformable anatomy tracking, adaptive CT generation and dose accumulation tools to enable the user to easily view the accumulated dose. Velocity fits well into the integrated Varian eco-system with workflow automation that allows Velocity to save to the unified ARIA/Eclipse database. Velocity sync with ARIA and Eclipse database supports automatic background synchronization of objects. This eliminates the need for manual data transfer from Velocity.



Velocity Navigators

The Velocity™ Navigators introduce tools that allow users to perform regular occurring tasks that guide the user step-by-step through a pre-defined workflow. For the offline review tools Velocity has two main navigators to use:

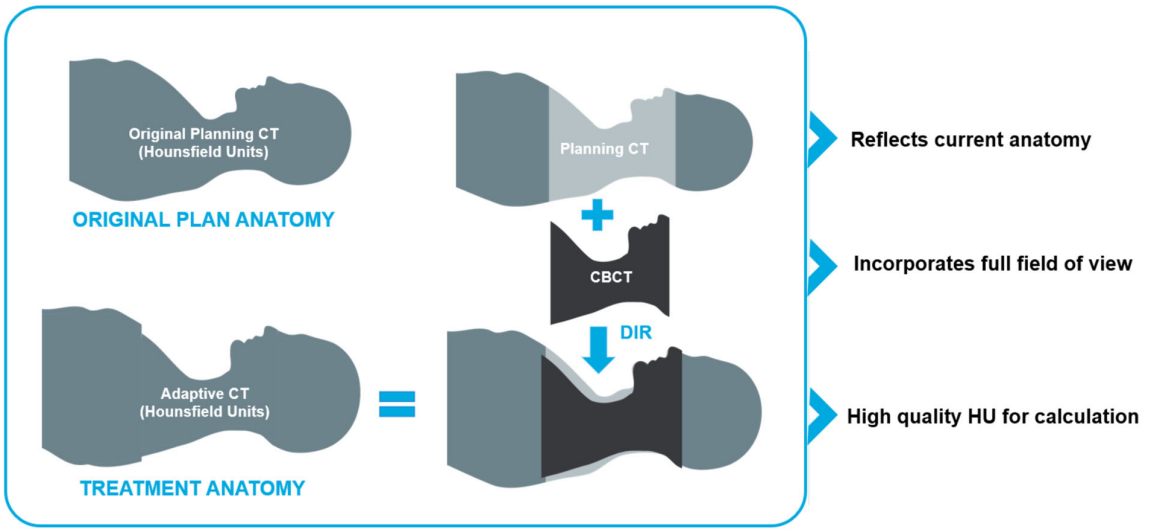
- Plan Generation ACTOR: Adaptive Calculation and Tracking for Offline Review
- Accumulation ACTIVE Dosimetry: Adaptive Calculation and Tracking for In Vivo Estimation of Dosimetry

These navigators are intended to let a clinical user combine RT-Plan information, along with online imaging acquired during treatment, and estimate delivered dose using the treatment planning system (TPS).

The ACTOR Navigator

ACTOR is an acronym for Adaptive Calculation and Tracking for Offline Review.

This navigator allows the user to register the CBCT (s) with the planning CT and create an adaptive CT. This adaptive CT utilizes the geometry of the CBCT in conjunction with the



Hounsfield units of the planning CT, to be used in place of the CBCT for dose calculation when performing offline adaptive planning.

Once the adaptive CT is created, a dose calculation is performed in Eclipse using the original isocentre, fields and MUs. This new dose calculation considers the changes associated with adjustments in patient set-up, changes in anatomical shape and location, thus providing a more accurate representation of the dose delivered. By mapping all the fraction dose distributions to the reference planning CT, dose can be accumulated voxel by voxel in a more meaningful way.

The ACTIVE Dosimetry Navigator

ACTIVE is an acronym for Adaptive Calculation and Tracking for In Vivo Estimation of Dosimetry.

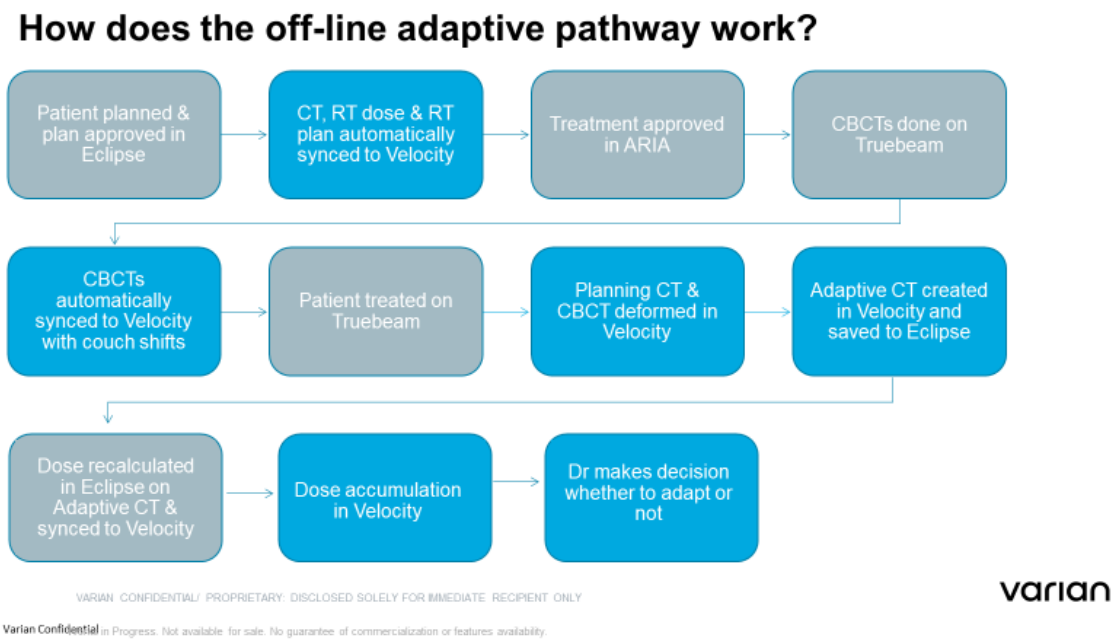
This navigator allows the user to monitor the patient treatment by comparing the delivered dose(s) to the original planning dose and the user can visually quantify the anatomical changes as well as the effect of set up errors that may exist between planned and delivered doses. Using departmental clinical protocols with the dose summation helps the user decide whether a patient needs to be re-planned or not.

Adaptive take away message

With your standard Varian software, you can do offline adaptive planning with little or no change to your existing workflow. The workflow has been streamlined and automated to suit the clinical needs of the user.

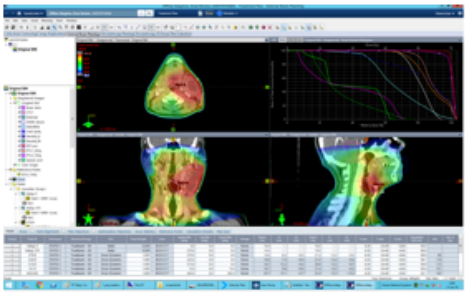
Typical steps in the adaptive workflow:

- The patient is planned and approved in Eclipse.
- At this point, the plan is automatically synced in Velocity in the background.
- Treatment is approved and scheduled in ARIA.
- And the CBCTs are acquired on the TrueBeam prior to treatment.
- Once the online match is determined this is automatically synced to Velocity with the CBCT in the background.
- Patient is then treated on the TrueBeam.
- A trigger of more than 0.5cm of weight loss for example can be used to decide if a dosimetric assessment is required.
- The planning team can then use the rigid registration in the treatment position between the Planning CT and the CBCT to create the deformable registration.
- An adaptive CT is also created and automatically saved to Eclipse.
- The original planned dose is then recalculated on the adaptive CT in Eclipse.
- This plan is automatically saved back to Velocity for further dose accumulation if required.
- Based on this information the Clinician can then make an informed decision if a new plan is required.



A detailed workflow diagram can also be seen below:

1.

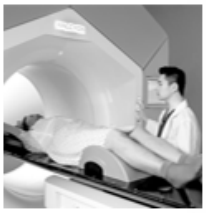


TREATMENT PLAN: ECLIPSE

Contouring, plan creation, optimization and dose calculation are executed in Eclipse

PLAN APPROVAL: ARIA

Plan is approved in ARIA and treatment is scheduled.

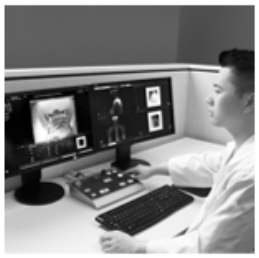


PATIENT TREATMENT

The patient is positioned on the treatment couch

IMAGE ACQUISITION

CBCTs are acquired before treatment



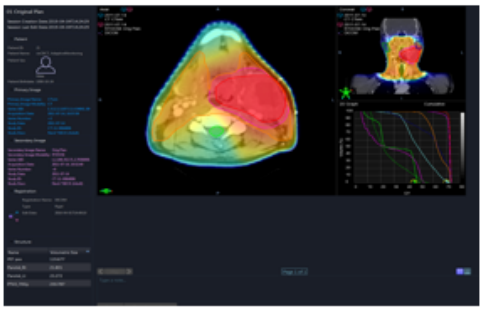
TREATMENT DELIVERY

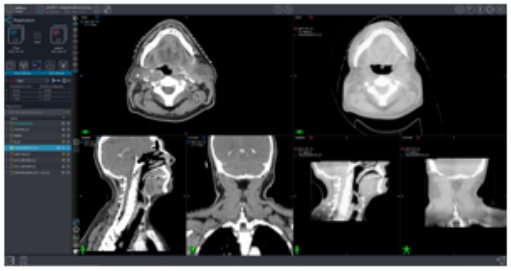
Once the ONLINEMATCH is approved the patient is treated. Once the patient is off the treatment table the offline review can proceed in Velocity.

2.

ECLIPSE PLAN IN VELOCITY

With Sync set up data automatically populates in Velocity. The planning CT, structure set, approved dose and plan will be ready in Velocity when the first CBCT is sent through.



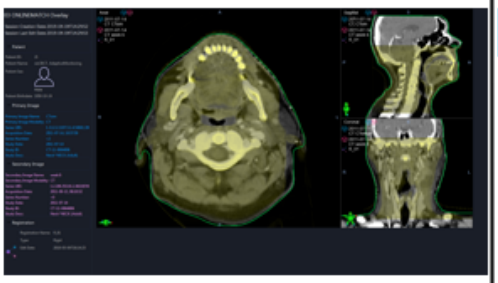


IMAGES IN VELOCITY

CBCT with ONLINEMATCH (rigid registration) from the linear accelerator is automatically pushed to Velocity.

ACTOR NAVIGATOR

ACTOR is an acronym for **A**daptive **C**alculation and **T**racking for **O**ffline **R**eview. This navigator allows the user to register the CBCT (s) with the planning CT and create an adaptive CT. This adaptive CT utilizes the geometry of the CBCT in conjunction with the Hounsfield units of the planning CT, to be used in place of the CBCT for dose calculation when performing offline adaptive planning.



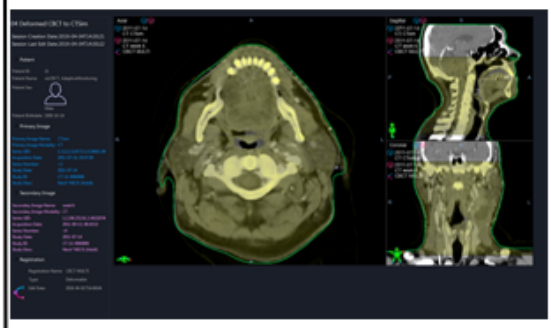
ONLINEMATCH FROM LINAC

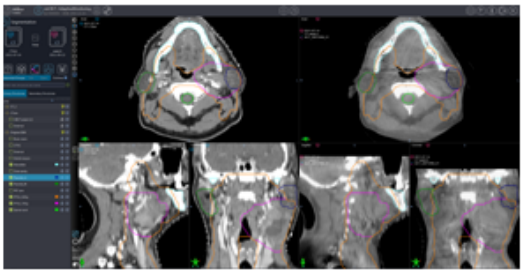
The ONLINEMATCH indicates the patient position on the treatment couch so an additional rigid registration is not required in Velocity.

3.

DEFORMABLE REGISTRATION

A deformable registration is performed between the CBCT and the Planning CT.



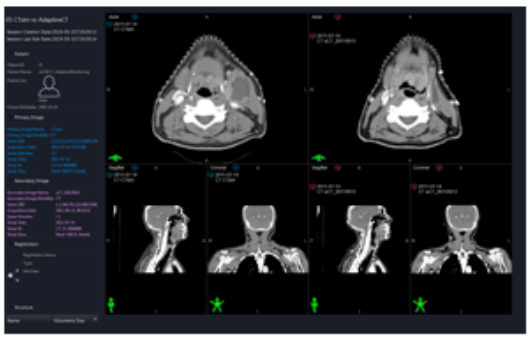


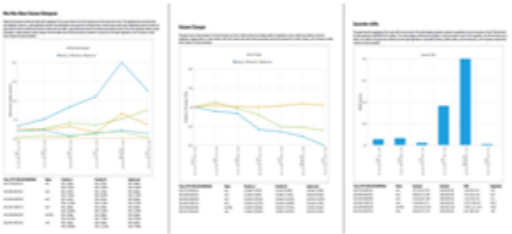
STRUCTURE PROPAGATION

Structures are automatically propagated after registration is completed.

ADAPTIVE CT GENERATION

Adaptive CT is created. This adaptive CT utilizes the geometry of the CBCT in conjunction with the Hounsfield units of the planning CT to be used in place of the CBCT for dose calculation when performing offline adaptive planning



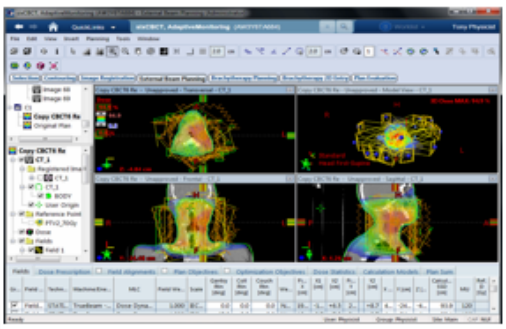


DIR QA REPORT

A QA report is generated with the results of the DIR. This report shows volume change analysis, deformable quality assurance, etc and helps the user quantify the differences between the planning and the CBCT(s).

ECLIPSE DOSE RECALCULATION

In Eclipse the user utilizes the container plan and only requires a simple calculation of the dose with preset values. This means the same isocentre, fields, plan coordinates and MU as the original plan is used to recalculate the plan on the new anatomy.
The physician can decide if the patient needs to be replanned at this stage, or if the patient should be monitored further.



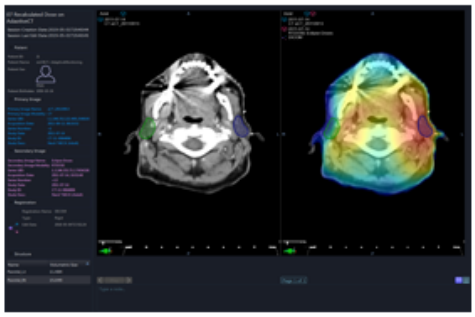
4.

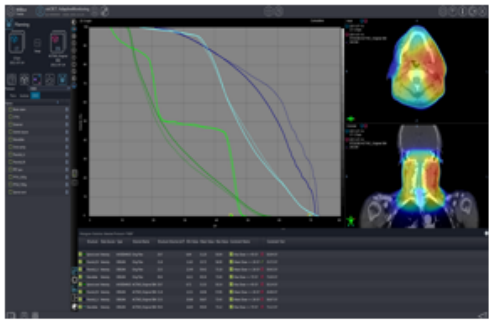
ACTIVE NAVIGATOR

The ACTIVE dosimetry navigator accumulates dose objects associated with RT-plans and monitors the treatment as it progresses. This navigator is used to sum any number of dose files and the user has the ability to compare the accumulated dose to the baseline (original) RT-plan and dose.

ADAPTIVE PLAN IN VELOCITY

The Adaptive dose and plan is automatically pushed back to Velocity.



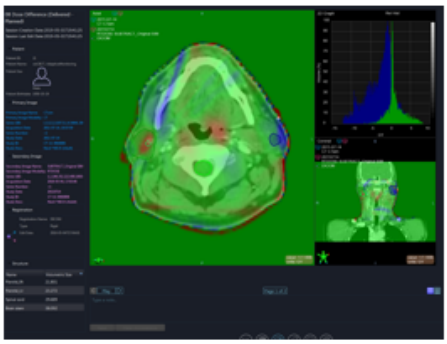


DOSE COMPARISON

The ACTIVE navigator allows the physician to compare the delivered dose to the original planned dose with a DVH comparison across multiple timepoints. With the use of clinical evaluation protocols, the scorecard can quickly identify which targets do not meet their clinical goals.

DOSE SUBTRACTION

Dose difference map and voxel level analysis shows a qualitative view of over-dosing and under-dosing.

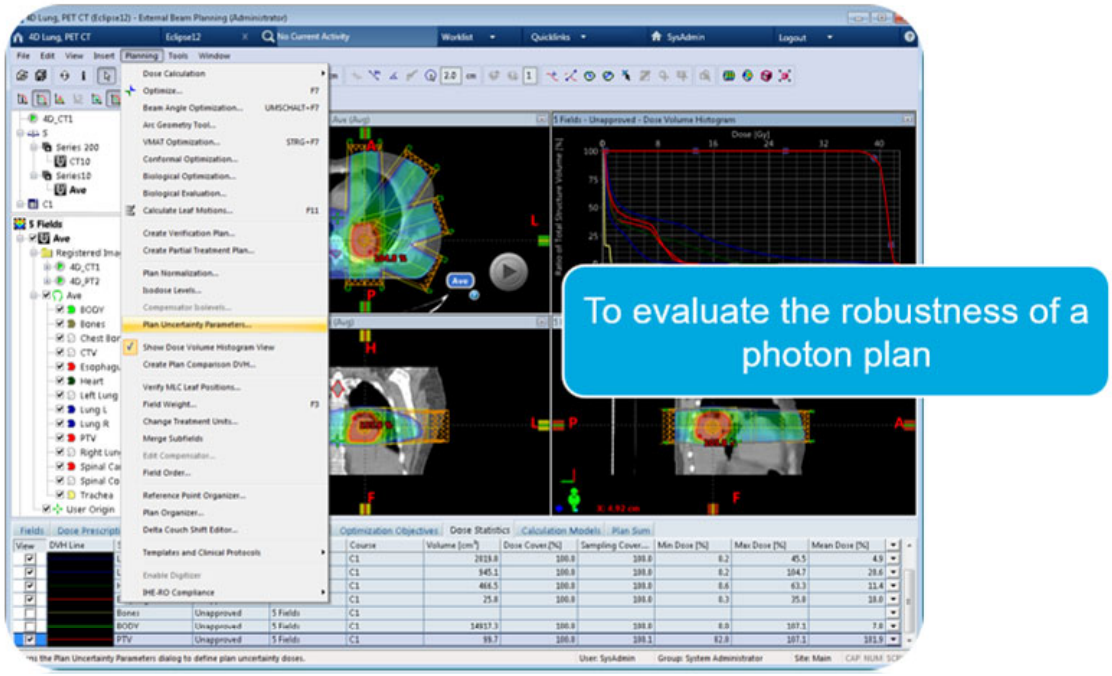


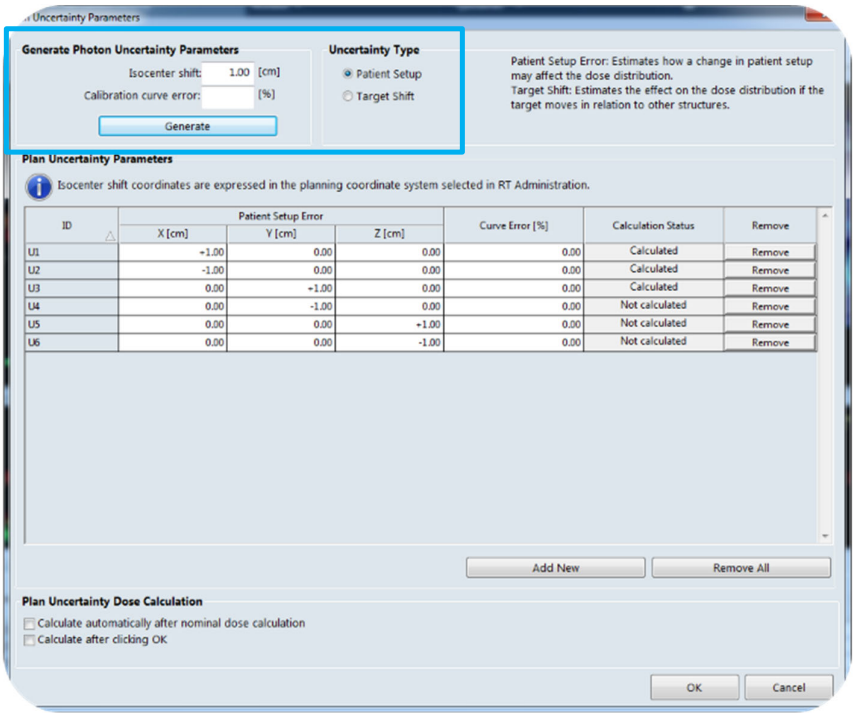
Rapid Re-planning & Dose Calculation As described above, Adaptive CTs (aCT) generated by Velocity's adaptive navigators can be automatically transferred to Eclipse for rapid dose calculation. In addition, by utilising the advanced scripting capabilities in Eclipse v16.1, dose calculation on the adaptive synthetic CT or new planning CT, where a re-scan has been acquired, can be automated. In Eclipse v16.1, users can use the Graphics processing unit (GPU) for both VMAT and IMRT optimization and final dose calculation with Acuros XB, to improve optimization and dose calculation performance. **RapidPlan for Re-plans & Scripting** RapidPlan in combination with ESAPI are the ideal tools to facilitate fast re-planning. The RapidPlan model used to generate the initial plan can be used to generate the replan in just one iteration in the optimizer. Eclipse scripting can be introduced to further automate this process in under 3 minutes. Cancer center teams around the world trust RapidPlan™ knowledge-based treatment planning software to create consistent, efficient, higher quality plans for individualized radiation treatment planning, through machine learning. By leveraging existing clinical expertise, your team can now move beyond templates to build the right plan, faster. RapidPlan models can be used as baselines for developing plans for virtually every type of external beam radiotherapy. RapidPlan provides estimated dose volume histograms that may be used as a guideline and starting point for IMRT & VMAT plans. RapidPlan uses the dose and patient anatomy information from existing plans to estimate the dose distribution in new patients based on their contoured anatomy.	

It is desirable that the TPS should be able to support "robust" planning techniques which will allow the effect of known uncertainties to be minimised in the treatment plan. Please describe any features of the TPS which facilitate this.

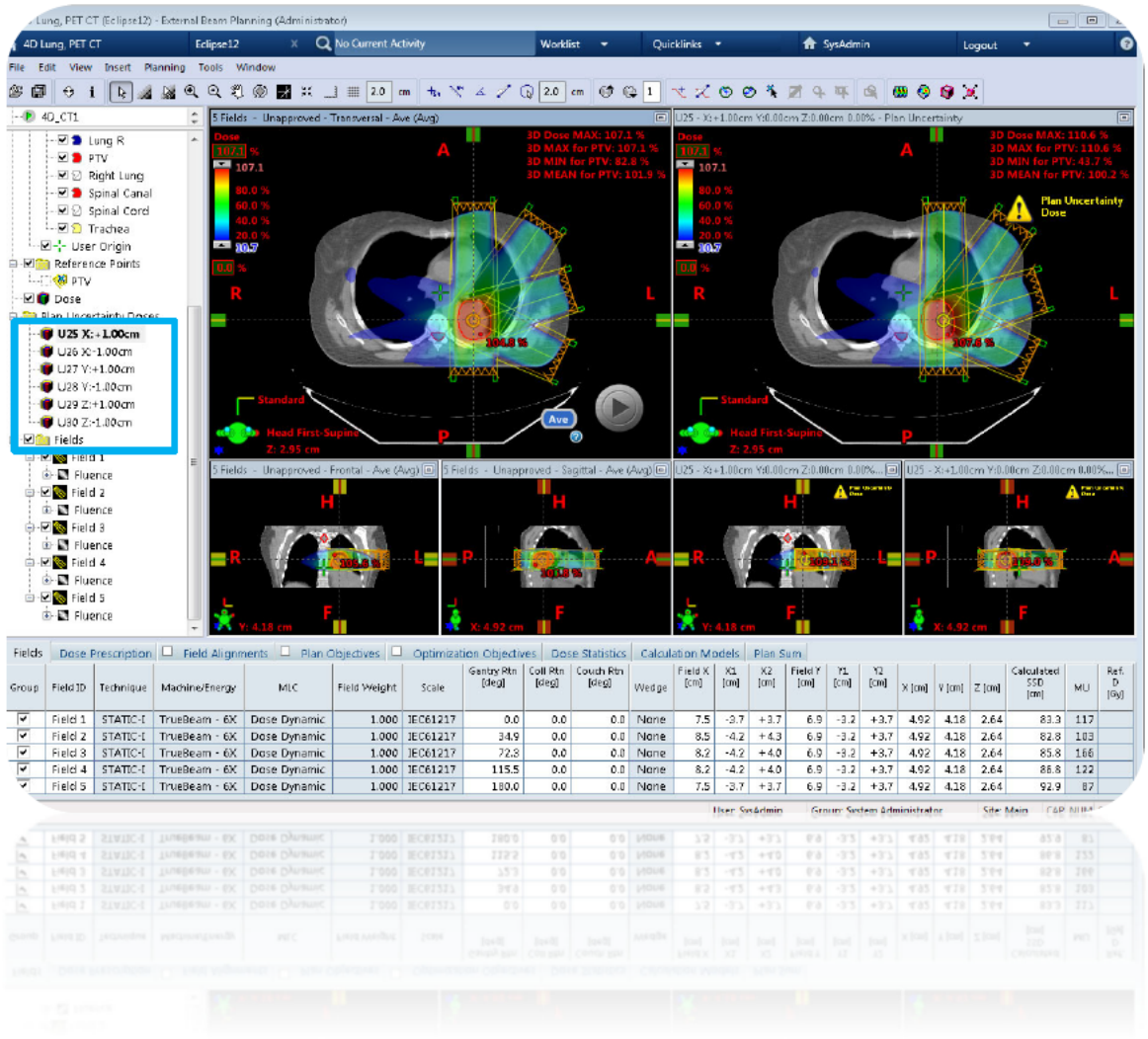
Contractor Response. Yes – Eclipse is fully compliant with this request. **Plan uncertainty tool** Within Eclipse plan uncertainty doses can be calculated at the same time as the nominal dose, or they can be calculated separately after the dose for the nominal plan has been calculated. The parameters that were used to create the plan uncertainty dose are shown after the plan uncertainty dose ID in the Focus Window. You can evaluate the plan uncertainty doses with the dose visualisation tools and compare the DVH of the nominal plan with the plan uncertainty doses. Plan uncertainty doses are saved in the database and you can open and view them later in External Beam Planning when you open the nominal plan they are associated with. You can calculate plan uncertainty doses before treatment. If you want to calculate plan uncertainty doses during the treatment, you can copy the approved plan, and calculate the uncertainty doses in the copied plan. • Planners can select the Target Shift option to evaluate the dosimetric consequences caused by the tumour moving in respect to OARs. The calculated DVH shows variations for anatomical structures.	(E)

- Select the Patient Setup option to evaluate the dosimetric consequences of a patient setup error on the target and OARs. The calculated DVH shows variations for both target structures and anatomical structures.



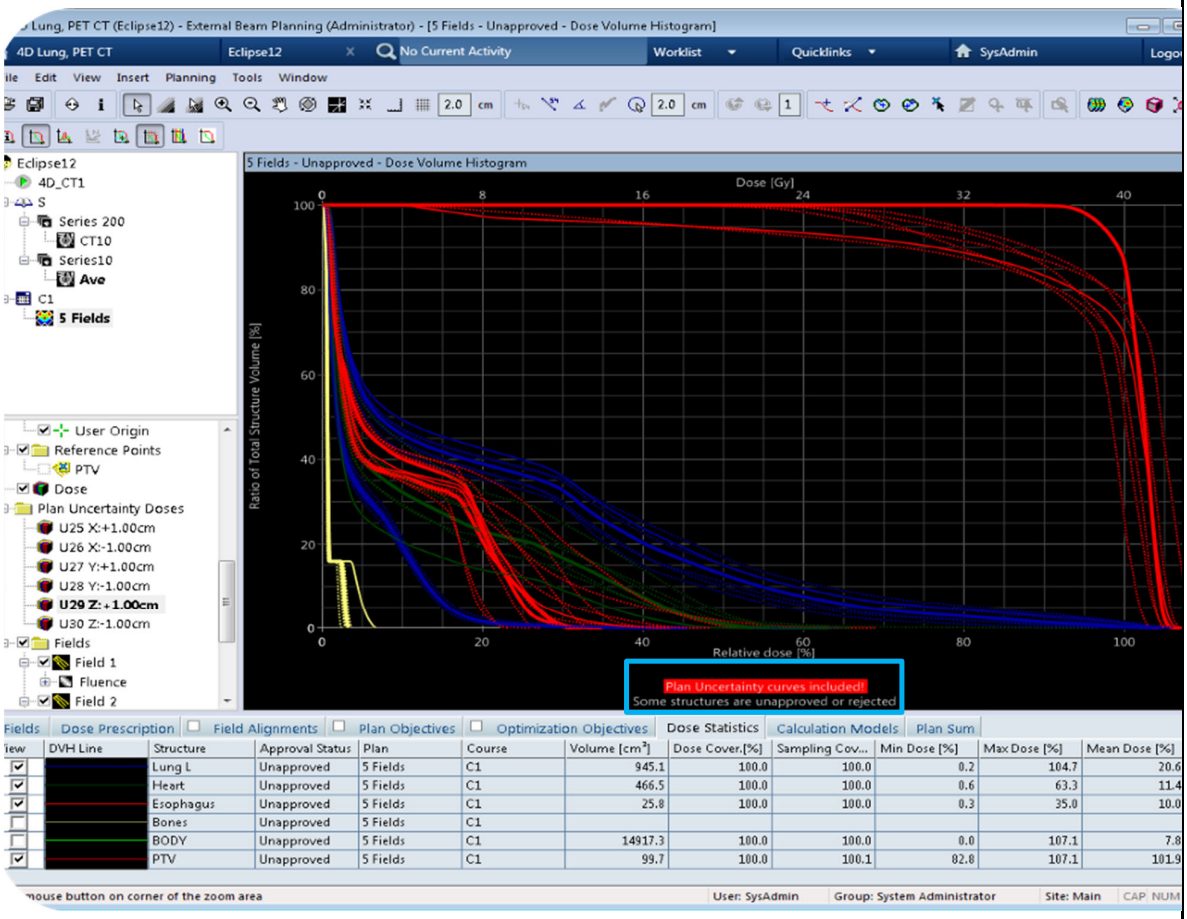


Plan uncertainty doses can be viewed in the Image view as seen below:



Group	Field ID	Technique	Machine/Energy	MLC	Field Weight	Scale	Gantry Rtn [deg]	Coll Rtn [deg]	Couch Rtn [deg]	Wedge	Field X [cm]	X1 [cm]	X2 [cm]	Field Y [cm]	Y1 [cm]	Y2 [cm]	X [cm]	Y [cm]	Z [cm]	Calculated SSD [cm]	MU	Ref. D [Gy]
☑	Field 1	STATIC-I	TrueBeam - 6X	Dose Dynamic	1.000	IEC61217	0.0	0.0	0.0	None	7.5	-3.7	+3.7	6.9	-3.2	+3.7	4.92	4.18	2.64	83.3	117	
☑	Field 2	STATIC-I	TrueBeam - 6X	Dose Dynamic	1.000	IEC61217	34.9	0.0	0.0	None	8.5	-4.2	+4.3	6.9	-3.2	+3.7	4.92	4.18	2.64	82.8	103	
☑	Field 3	STATIC-I	TrueBeam - 6X	Dose Dynamic	1.000	IEC61217	72.3	0.0	0.0	None	8.2	-4.2	+4.0	6.9	-3.2	+3.7	4.92	4.18	2.64	85.8	166	
☑	Field 4	STATIC-I	TrueBeam - 6X	Dose Dynamic	1.000	IEC61217	115.5	0.0	0.0	None	8.2	-4.2	+4.0	6.9	-3.2	+3.7	4.92	4.18	2.64	88.8	122	
☑	Field 5	STATIC-I	TrueBeam - 6X	Dose Dynamic	1.000	IEC61217	180.0	0.0	0.0	None	7.5	-3.7	+3.7	6.9	-3.2	+3.7	4.92	4.18	2.64	92.9	87	

Plan uncertainty doses can also be viewed in the DVH as seen below:



RT PeerReview

Robust evaluation of volumes & plans by peers

The RT peer Review license exists within Eclipse and has been included within our offering. This provides an integrated, collaborative, workspace to streamline the peer review process as a whole. This workspace is designed to speed up the prep and plan review process and also improve communication between teams. When you begin the review meeting, clinical teams can review a comprehensive overview of volume or plan information from Eclipse alongside demographic and diagnostic information and the prescription details and treatment and imaging progress all within one workspace.

There are also 3 possible actions that can be chosen on completion of each review to help to improve communication.

Below are the steps in the RT peer review workflow:

- Firstly, teams can Create Bookmarks for structure sets or the plans in the external beam planning workspace. A bookmark manager is available to help teams view or edit these bookmarks and add them to a review session.

- Teams can then organise and launch the review session from a designated workspace and follow up on any highlighted action items.
- A patient history view and summary view can be exported as PDF documents.

Robust Evaluation of optimization results

RapidPlan can be used to benchmark the standard of plans produced across the planning team and can ensure consistent plan quality across a team with varied experience. RapidPlan is a paradigm for treatment planning aimed to capture clinical practices based on treatment plans that were done in the past, developing new treatment planning models that will reflect the clinical experience and apply these models to future patients. Thus, future patients benefit from the learning of past patients.

In a busy clinical environment, this tool helps increasing the efficiency for the treatment planning process for IMRT and VMAT techniques. Clinical teams can build their own models based on their own plan evaluation criteria. RapidPlan can be used to standardise workflows for complex techniques and provide fast optimization with DVH estimates and automatically generated objectives using machine learning algorithms.

MCO

MCO leverages both RapidPlan Knowledge-Based Planning and the existing optimization workflows — helping the user find the optimal plan for a given patient, quickly and with more certainty

Eclipse Multi-Criteria Optimization (MCO) is available for IMRT and VMAT and allows real-time exploration of what happens when different clinical criteria are varied. MCO-based Trade-Off Exploration in Eclipse represents a ground-up implementation of the application of multi-objective optimization to the radiotherapy treatment planning domain, developed in a collaboration with the Fraunhofer Institute for Industrial Mathematics, Kaiserslautern, Germany. The idea behind the algorithm is to treat the treatment planning problem as a multi-objective optimization problem. In such a problem, a vector of objective functions is optimized instead of a single objective function.

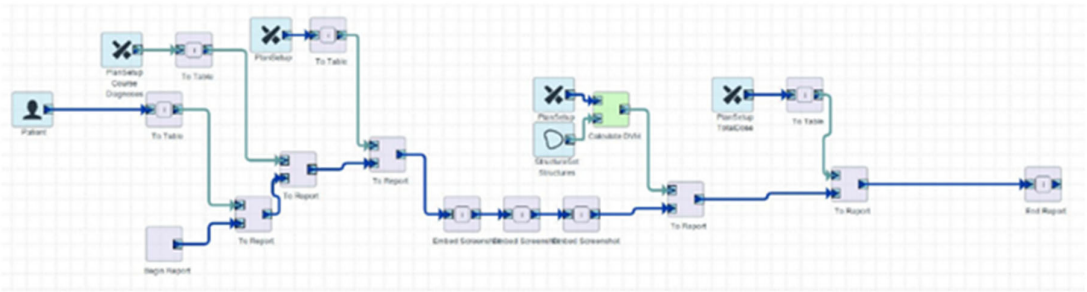
The starting point of trade-off exploration using MCO in Eclipse is that you have already created a candidate plan. This plan may have been created for example with RapidPlan, or by conventional optimization. This plan will serve as the centre of an approximation of the Pareto surface.

To obtain the approximation of the Pareto surface, the user needs to specify a number of trade-off objectives that wants to explore. A number of alternative treatment plans are created by varying a source plan with regards to the trade-off objectives and performing an optimization for each of the alternative plans. For example, one alternative plan may have improved sparing of an OAR but less target coverage, while another alternative plan may have improved target coverage but higher dose to the OAR.

When the generation of alternative plans is finished, the Trade-Off Exploration mode of the Optimization dialog box displays a number of sliders (one slider for each trade-off objective). The sliders can be used to systematically modify the start plan.

This is achieved by intelligently “mixing” the candidate plan with the alternative treatment plans. The dose and DVH curves are updated in real time while the sliders are manipulated. MCO leverages both RapidPlan Knowledge-Based Planning and the existing optimization workflows — helping the user find the optimal plan for a given patient, quickly and with more certainty. MCO based Trade-Off Exploration offers tools for real-time exploration and visual evaluation of the range of trade-offs in target coverage and healthy tissue sparing for IMRT, VMAT plans. These tools can also be applied to any re-plans as a result of calculation results on an adaptive synthetic CTs.	

It is desirable that the TPS should support scripting to aid the automation of frequently used functions. Please indicate whether this is supported and the range of tasks that can be scripted**.**

Contractor Response. **Eclipse Scripting API and Visual Scripting** Eclipse boasts two forms of scripting. The Visual Scripting module is an object orientated GUI that allows the user to easily gather patient data into a simple report. For example, standard DVH calculations are possible such as V50, D95 etc. The Eclipse Scripting API feature allows the user to perform more complex actions and calculations, for reporting and plan comparisons the user could code and integrate any metrics unique to their department directly into the External Beam Planning workspace. Eclipse supports single file plug-in scripts, binary file plug-in scripts, standalone executables and visual scripting, using the C#.NET programming language. Eclipse Scripting API provides access to all planning data, including full plan geometry for Photon, Proton and Brachytherapy plans, Structure Sets, Image, Dose, DVHs and more. Within the Visual Scripting workspace, the user can create and manage API scripts with a visual programming method, without the need to know how to program with C# programming language. **A Visual Scripting workbench is available, providing a graphical flowchart interface for users to create custom reports.**  Eclipse API Scripting allows for automation Import of CT, adding either a simple field or an arc, call the optimizer and run it and calculate the dose. Write Access API scripting is available for clinical systems and used in conjunction with script approval. This allows creation and	(E)

modification of structure and plan data, and execution of dose calculation and optimization algorithms.

Although Eclipse uses C# in clinical environment, Python can be used in a research environment. Scripts written using Python can also be implemented using pyESAPI for research purposes.

By using the Eclipse Scripting API, the user can access the following Information:

- Image and structure models, including their volumetric representations.
- Plans, fields and accessories.
- Predecessor plans
- Plan protocol information
- IMRT optimization objectives and parameters.
- Doses, including their volumetric representations.
- Dose volume histograms
- Optimal fluences
- DVH estimates
- Plan uncertainty information
- Prescription Information
- Treatment session information
- Display plan quality metrics

In addition, with Eclipse Automation, the user can create scripts that:

- Create and modify structures and structure sets.
- Create and modify plans and fields.
- Create and modify verification plans and copy images from another patient for those plans (for example, copy a scanned phantom image from a designated case).
- Create artificial phantom images.
- Generate DRRs.
- Create evaluation doses to evaluate dose calculated outside of Eclipse.
- Optimize plans by using the Eclipse optimization algorithms.
- Calculate leaf motions by using the Eclipse leaf motion calculation algorithms.
- Calculate dose by using the Eclipse dose calculation algorithms.
- Execute DVH estimation.
- Modify raw and final scan spot lists for proton plans.

Eclipse scripting also allows access to treatment delivery data via SmartAdapt and Portal Dosimetry APIs and web services like Aria Documents service, ARIA Access service.

Within Eclipse Version 16, it is now possible to get the active PlanSum with new property ScriptContext.PlanSum.

It is now possible to create PlanSums, remove PlanSums and edit PlanSums with Eclipse Scripting API.

- New method Course.CreatePlanSum to create PlanSum.

About the Eclipse Scripting API 18:

- New method Course.RemovePlanSum to remove PlanSum.
- New methods PlanSum.AddItem, RemoveItem, SetPlanWeight SetPlanSumOperation to edit PlanSum.
- Property PlanSum.Name now has a setter.

Automation of plan optimization Via API Scripting

Within the Varian IRS, write Access API scripting is also available for clinical systems and used in conjunction with script approval. This allows creation and modification of structure and plan data, and execution of dose calculation and optimization algorithms. Scripts can be created by individual teams based on their workflows and clinical needs.

The powerful combination of RapidPlan and MCO with scripting can be used to automate the plan creation and optimization process using RapidPlan and MCO and final dose calculation using AcurosXB. The script will also generate a plan report for review against intended clinical goals. Following this workflow an IMRT plan for a prostate case can be generated and optimized in just 2m 10Sec.

Scripting in Velocity

Velocity supports scripting using both C# and Python to create combined Eclipse and Velocity scripts.

It is desirable that the TPS should be able to support "data mining" to allow the Health Board to extract statistical & clinical data from the systems database. Please provide a description of the available functions.

Contractor Response. (E)

Yes – Eclipse is fully compliant with this request.

Eclipse Scripting API and Visual Scripting

Eclipse boasts two forms of scripting. The Visual Scripting module is an object orientated GUI that allows the user to easily gather patient data into a simple report. For example, standard DVH calculations are possible such as V50, D95 etc. The Eclipse Scripting API feature allows the user to perform more complex actions and calculations, for reporting and plan comparisons the user could code and integrate any metrics unique to their department directly into the External Beam Planning workspace.

In addition to this, the AURA reporting tool (ARIA unified reporting) is an advanced reporting platform which enables the Board to mine data for equipment, patients and activities. AURA provides over 130 pre-validated and configured reports, grouped into administration, billing, clinical, data QA, metrics, patient, scheduling, Varian service, lists, physics and other. These are reports that are provided with thumbnail views of the appearance of the report, and which provide validated, standard views of the data extracted from the data warehouse. AURA can be used for reporting (static reports), basic charts and graphs and to schedule and share reports

Included with current version of ARIA. As well as the pre-defined reports in AURA there is the option for custom reports, this can either be in the form of customised existing reports or new reports developed entirely. Where the board utilises ARIA alongside Eclipse to support data entry, paperless working, scheduling and activity completion through ARIA this will facilitate the Board in being able to data mine both statistical and clinical data from their own database which can support quality improvements, service development and proactive change.	

Describe separately any other special features, e.g. knowledge-based planning, multi-criteria optimisation, AI-type rapid/class solutions, advanced registration techniques, etc.

Contractor Response. **RapidPlan** 2 Licenses for RapidPlan have been included within this tender offering. RapidPlan is a paradigm for Treatment Planning aimed to capture clinical practices based on treatment plans that were done in the past, developing new Treatment Planning models that will reflect the clinical experience and apply these models to future patients. Thus, future patients benefit from the learning of past patients. In a busy clinical environment, this tool helps increase the efficiency for the treatment planning process for IMRT and VMAT techniques. For a clinic that might be new to inverse planning techniques, even SBRT techniques, RapidPlan brings the possibility to use models created by other experts on the field and apply their learning to their own clinical program and speed up the learning curve for the users. Clinical teams can also build their own models based on their own plan evaluation criteria. RapidPlan can be used to standardise workflows for complex techniques and provide fast optimization with DVH estimates and automatically generated objectives using machine learning algorithms. **Machine Learning Algorithms** Varian's RapidPlan™ Knowledge-Based Planning Software leverages a machine learning approach and helps clinicians at centres around the world to take treatment planning to new levels of consistency, efficiency and quality. RapidPlan was designed to break through productivity barriers by enabling clinicians to use standard models as a guideline and starting point for developing high quality treatment plans. This can reduce or even eliminate the need for multiple, time-consuming iterations. RapidPlan knowledge-based planning allows clinicians to develop their own models from their database of plans or to use shared models developed at other institutions. Since the introduction of RapidPlan in 2014, the availability of shared models has grown, enabling centres to make gains in planning consistency and efficiency. A DVH estimation algorithm is used for creating and applying DVH estimation models to be used in treatment planning with RapidPlan. The main purpose of the DVH estimation algorithm is to estimate what would be an achievable Dose-Volume Histogram (DVH) for various critical organs. The estimations are based on the actual DVHs achieved in earlier planned patient cases (historical plans). These estimated DVHs can be translated into optimization objectives. The	(E)

optimization objectives are set so that the optimizer tries to achieve the estimated DVHs. The algorithm is divided into model configuration and the DVH estimation components.

The model configuration component is used for configuring new DVH estimation models that can then be used in the DVH estimation component to get estimates for a single plan. The model configuration component consists of two phases, the data extraction phase and the model training phase.

The DVH estimation component consists of estimation generation and objective generation phases. Targets may have freely defined dose levels. You can define 1-10 target structures in a DVH estimation model. The user may want to have several targets, if they have qualitatively different dose distributions or different optimization objectives. The information needed for estimations is stored in a DVH estimation model. This model is created by using the training phase of the DVH estimation algorithm and a set of earlier planned cases, that have been added to a training set by performing the extraction phase of the DVH estimation algorithm. During the extraction phase, the original plans must contain structure sets, field geometry, dose matrices and plan prescriptions. The scope of this algorithm has been developed solely for IMRT and VMAT plans.

The model configuration workspace in Eclipse provides a dashboard to review the plans that have been added to the model and analyse a set of statistics to perform outlier detection. Outliers are found by applying different statistical metrics (such as Z-statistic, modified Z-statistic and studentized residuals) over the Organ-at-Risk (OAR) metrics (anatomical features and principal component scores), target metrics (volumes and relative doses) and plan metrics (dose prescription). Clinical teams have found that model analysis is a fantastic audit tool and can help to standardise not only planning practices but also contouring practices between Clinicians.

Multi-criterial Optimization

2 Licenses for MCO have been included within this tender offering.

To achieve further automation, Eclipse Multi-Criteria Optimization (MCO) is available for IMRT and VMAT planning. When machine learning with the use of RapidPlan generates the optimal baseline treatment plan, and you add your intelligence and expertise to control, personalize, and fine-tune each individual plan through MCO, your treatment planning is taken to a whole new level. That is what makes RapidPlan and MCO more than just machine learning. It is what we call machine intelligence—a consistent, data-driven, highly efficient way of treatment planning. With the use of Eclipse Scripting API tools, the optimization workflow using Rapidplan and MCO can be fully automated.

Trade-off exploration is a clinical decision support tool that enables clinicians to quickly improve plan quality by balancing clinical trade-offs. By using this tool, clinicians can explore what happens when they modify different clinical criteria, such as the degree to which organs are spared versus coverage of the targeted tumour, without a time-consuming re-planning process.

The Epsilon-constraint based plan generation algorithm uses a candidate plan to seed the search space for creating the plans used in the Multi-criteria Optimization (MCO) navigation. This plan creation is automated. This local multi-criteria workflow in Eclipse, allows the user to assess the clinical quality of the optimization model prior to generating the pareto plan database. This

approach narrows the search space and reduces the error between the navigated plan and the final deliverable plan. This tool is fully integrated into the Photon Optimizer.

When the generation of alternative plans is finished, the Trade-off Exploration mode displays one slider for each trade-off objective. The sliders can be used to systematically modify the original plan. This is achieved by intelligently "mixing" the original plan with the alternative treatment plans. The dose and DVH curves are updated in real time while the sliders are manipulated, allowing for a smooth navigation through the different clinical scenarios.

Our product managers worked closely with clinical collaborators to make the trade-off selection and navigation tools easy to understand and use:

- Instant feedback speeds up the exploration process.
- Green/red indicators on the sliders provide visual reference to the effect that adjusting one slider has on the remaining structures, red = degrading, green = improvements.
- You can use restrictors to stop the degradation of selected objectives- for example the brainstem dose might already be 55Gy max, to keep it at that dose level, users can use a restrictor.

The DVH always shows the curves for the original plan before exploring the trade-offs.

- You can adjust the sliders and look at the dose distribution, the plan objectives and DVH in real time as shown in the photon optimizer above.

Goal Analyser Guided Automated MCO

The clinical goal driven MCO functionality enhances the alignment between the clinical objectives and the trade-off exploration by adding another layer of automation to the process. Priorities of clinical goals are set when the plan is created, as shown below. The MCO sliders are then automatically moved to reflect these priorities during optimization.

Automated Local Dose Correction

The local dose correction feature allows the user to further fine tune the final plan by reducing the presence of hot or cold spots. This tool negates the creation of dummy contours for hot and cold spots further automating the optimization process.

Trade-off exploration is a consistent, flexible and versatile way to develop plans for virtually every type of external beam radiotherapy for inverse planning techniques such as IMRT and RapidArc® and is available for any machine that is supported for photon optimization in Eclipse™, including Elekta VersaHD and Agility MLC.

The powerful combination of RapidPlan and MCO with Eclipse scripting can be used to automate the entire plan creation pathway including, the optimization process and generate a plan report for review against intended clinical goals, all within a single script. Following this workflow, an IMRT plan for a prostate case can be generated and optimized in just 2m 10Sec.

AI-Rad Companion Organs RT

With respect to the case mix at Edinburgh Cancer Centre highlighted below:

- VMAT: 1200 pts
- 3D planning:1500 pts

5 x 1-year licences have been included for 1,000 patients in each year within this tender offering.

Harness the power of AI technology

AI-Rad Companion Organs RT is a cloud-based, deep learning, automatic contouring tool that can be accessed directly within any TPS (treatment planning system). Contoured structure sets can be generated automatically on the planning scan directly after the planning scan has been done, using any CT scanner, making this solution flexible and vendor neutral. It leverages AI technology to seamlessly segment individual organs-at-risk (OAR) and enhance the efficiencies of radiation therapy treatment planning.

We are constantly updating and adding functionality (e.g. added organs) to our AI RAD Companion Organs RT solution. As an existing customer, you will receive regular updates and added functionalities through cloud-based updates without causing any downtime for your service

Auto-contouring using AI provides consistent contours and allows users time to review these contours - manual contouring is time consuming but AI contouring helps free up planner's time to focus on other tasks in treatment planning. Once the system is installed, automatic sending of data to Eclipse is implemented (no-click contouring). Both the CT and structures are automatically imported also saving time manually importing the planning scans into the TPS.

The models are regularly updated at no additional cost to clinical teams and is easily deployed with cloud-based access.

AI-Rad Companion includes comprehensive support for multiple disease sites shown below:

AI-Rad Companion Organs RT was designed to meet the highest data protection and cyber security standards.

AI Rad Companion uses the teamplay authentication and with it teamplay user accounts. Interactive access to teamplay and AI Rad Companion is protected by password-based user authentication secured via Transport Layer Security (TLS). A minimum password complexity is enforced, and a user interface is provided for changing the password.

An explicit logout function is provided. In addition, if the user is inactive within AI Rad Companion for 60 minutes, the session is ended, and the user must log in again.

The teamplay receiver software along with AI Rad Companion software, in case of local processing, authenticates the teamplay web services using TLS server authentication, the Receiver is authenticated using TLS client authentication. Institutions can enforce Multifactor authentication for specified users.

Integration of the identity provider of the institution using SAML (Security Assertion Markup Language) or using ADFS (Active Directory Federated Service) is also supported. In this case, each authentication request for a teamplay user is redirected to the institutions' identity provider, and the institutions authentication policy is applied

RT PeerReview

1 x License for RT PeerReview has been included within this tender offering

The RT peer review license exists within Eclipse and has been included within our offering. This provides an integrated, collaborative, workspace to streamline the peer review process as a whole. This workspace is designed to speed up the prep and plan review process and also improve communication between teams. When you begin the review meeting, clinical teams can review a comprehensive overview of volume or plan information from Eclipse alongside demographic and diagnostic information and the prescription details and treatment and imaging progress all within one workspace.

There are also 3 possible actions that can be chosen on completion of each review to help to improve communication.

Below are the steps in the RT peer review workflow:

- Firstly, teams can Create Bookmarks for structure sets or the plans in the external beam planning workspace. A bookmark manager is available to help teams view or edit these bookmarks and add them to a review session.
- Teams can then organise and launch the review session from a designated workspace and follow up on any highlighted action items.
- A patient history view and summary view can be exported as PDF documents.

Velocity's Constrained B-Spine algorithm

4 x Licenses for Velocity have been included within this tender offering.

This product provides a radiotherapy specific vendor neutral imaging platform which aggregates image data from a wide variety of imaging modalities, planning systems and devices. As a result, clinicians are able to build a longitudinal patient history that is image driven and allows clinicians to visualise tumour response following treatment and support better decision making. In combination with ARIA, Eclipse and the delivery systems, the dose accumulation features of Velocity provide a strong platform for adaptive planning, which support better clinical decisions. The infrastructure on which Velocity sits is integrated into the ARIA/Eclipse platform and provides remote access to the clinician wherever and whenever needed. These features include

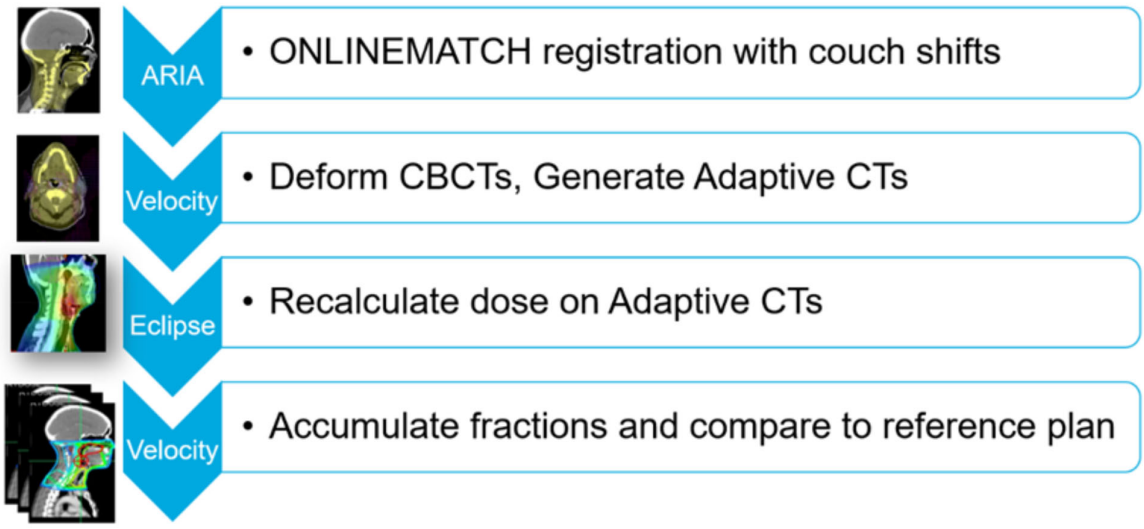
multi-modality image registration tools which allow the user to register CT, CBCT, PET, SPECT, MR and RT Data for viewing and analysis. As Velocity is a vendor neutral RT archive, it can store all DICOM/DICOM-RT files, which are displayed in a timeline view. This timeline view includes data that is synchronized from ARIA/Eclipse and is displayed in an easy to view patient map, making the complicated data easy to read. Velocity has dose tracking capabilities which allow the user to track the dose during a course of treatment and between courses of treatments. This dose can be mapped from previous plans and may be incorporated into decision making with a new treatment plan. Navigators, a Velocity assistant tool, are included in the software which facilitate and automate frequently used workflows, such as image registrations and dose summations, thus easing the burden on the clinical user.

The algorithm used in Velocity is an elastic B-spline algorithm and mutual information as the cost function metric for matching and aligning the tissue anatomy. Velocity's elastic approach aims to mimic natural soft tissue movement and maintain anatomical integrity. This includes constrained regularisation which prevents unnatural behaviour such as voxels jumping over each other, limiting the number of large magnitude errors and creating a fusion with a smooth deformation vector field. The registration matrix can be exported as a binary deformation field (BDF) file for research and clinical validation.

The deformable algorithm is applicable to both images and dose objects alike, performed manually or completely automated through the built-in adaptive navigators described below as part of an adaptive radiotherapy course.

Overview of the Off-Line adaptive Process

Using the Varian® software solution for offline review, the user does not need to change their workflow as all planning will still be done in the Eclipse™ treatment planning system. ARIA provides image storage, plan approval and treatment details. From the linear accelerator the table shifts, and treatments records are obtained. In addition, Velocity provides the deformable anatomy tracking, adaptive CT generation and dose accumulation tools to enable the user to easily view the accumulated dose. Velocity fits well into the integrated Varian eco-system with workflow automation that allows Velocity to save to the unified ARIA/Eclipse database. Velocity syncs with ARIA and Eclipse database supports automatic background synchronization of objects. This eliminates the need for manual data transfer from Velocity.



HyperArc

1 x HyperArc user package has been included as optional in this tender

HyperArc is a module within Eclipse specifically designed for streamlined planning of intracranial frameless radiosurgery, also for complex cases with multiple metastases. New algorithms simplify the planning process and automated delivery ensures all radiosurgery cases – independent of the number of targets – can be accomplished within a regular treatment slot of maximum 20 minutes.

To meet increased demand for efficient and high-quality SRS planning, HyperArc™ is an end-to-end class solution for the treatment of intracranial targets. Delivery sequences are derived from a pre-defined series of trajectories using a single isocenter and new optimization tools optimize not only dose, but also treatment delivery. SRS specific quality metrics are included within HyperArc to assist in evaluating plan quality and HyperArc treatment delivery is undertaken with a single click at the console. There is no need for the therapist to enter the linac room between fields to adjust either gantry or table position.

The frameless Encompass™ SRS mask system, that ensures a high level of stability during treatment, is integrated into Eclipse for optimal patient safety and collision-free planning. The Virtual Dry Run allows viewing all gantry and table positions / motion in a 3D animation during the planning process to guarantee there will be no collisions in the treatment room.

Unique steps in the HyperArc planning process include:

- Virtual Dry Run
- Pre-defined arc trajectory selection
- Safe and optimized isocenter placement
- Automatic collimator optimization algorithm
- Automatic lower dose objective algorithm (ALDO)
- SRS normal tissue objective
- Integrated calculation of SRS-specific target quality metrics

The simplified and automated planning process provides high levels of consistency such that even lesser-experienced planners are able to create high quality plans with confidence.	

4.2.7 Paperless working:

The Board aims to use paperless workflows more extensively. The Contractor should describe the functionality of the offered Products, as it relates to these requirements, as well as how, and to what extent, the offered Products meet this requirement.

(E) provide details

The integration of Varian platforms enables safe and effective provision of patient care, aggregating patient data into a single, organized, oncology-specific medical chart. The complexities associated with oncology care provision requires a dedicated system that fulfills the niche requirements for safe, high-quality care delivery. Safety is maximized when there is a single source of truth, containing a unified dataset. This integration also minimizes the risk of human error and expedites the transition from referral through to treatment. Increasing patient volumes and recent advancements in radiation therapy delivery have created a need for more automated processes. The platform is designed to allow the user to electronically capture all data pertaining to a radiotherapy patient pathway by the users at the point of care in the most efficient way.

The implementation of paperless workflow requires the synchronous optimization of technology, processes and people.

- Technology: Varian's platform is filled with features to support safe and efficient implementation of paperless clinical workflow.
  This includes but is not limited to:
  - Electronic Referral in ARIA.
  - Scheduling of carepaths encompassing both patient-facing and non patient-facing steps in the patient pathway (including all treatment planning steps).
  - CT documentation
  - Electronic prescription (user right protected with multiple signature possibilities).
  - Planning notes and communication.
  - Peer Review documentation and communication.
  - Daily Treatment documentation.
  - Brachytherapy workflow and documentation.
  - Clinical patient management, including lab results, toxicity management, review of systems etc.
- Processes: Implementation of key technological workflow features allows for process optimization, to take full advantage of the benefits of Varian platform. Varian supports process optimization through implementation support.
- People: To adopt platform features and new processes, Varian recognises that optimal support of the clinical team during the transition and implementation phases are key to success. Our comprehensive training and implementation support packages are designed to ensure that your people are supported and empowered to embrace your optimized digital workflow.

4.2.8 Future Developments

In respect of the TPS to be supplied to the Health Boards, Contractors should provide full details of their participation in IHE Connectathons, planned releases and development areas proposed for the period of twenty-four (24) months from submission of their Tender and state likely implications for any computer hardware and software specifically identifying any implications for existing radiotherapy equipment in use by the Health Board.

Contractor Response:	(E)
[redacted]	

4.2.9 Benefits, Risks & Consequences of Change

Radiotherapy treatment delivery is a complex, multi-stage process incorporating many inter-related stages of booking, simulation, planning and treatment and draws on multiple, specialised human and technical resources. The Health Board has an existing set of protocols and work processes that have been developed to deliver a safe service and the benefits, risks and consequences from implementing new equipment and software need to be assessed as part of this tender.

The TPS is a core component of the radiotherapy clinical pathway. Radiotherapy Physics staff are involved in localisation, beam modelling and the creation of documentation using the TPS. Therapy Radiography staff carry out treatments based on documentation produced by the TPS, while clinical staff localise targets, assess dose distributions and prescribe the final radiotherapy treatment based on the TPS facilities and output.

The Contractor must provide sufficient details to allow assessment of the consequences and/or risks of implementing their offered TPS to each of the Health Boards as part of their bid. Details to be provided include the compatibility with the existing knowledge base and skill set of staff in each of the areas noted above, and the estimated time to educate for new features and functionality, the overall length of training, and the clinical implications from the potential delay in implementing new features. The Contractor should indicate the expected benefits to be gained from introducing this functionality and feature set, particularly those areas identified in the General Introduction of this document.

In addition, the Contractor should provide technical details of any arrangements to facilitate migration, or integration, of patient planning information stored within the department's existing treatment planning system into the patient planning information storage system of the tendered equipment.

Contractor Response	(E)
As NHS Lothian currently uses Varian Eclipse TPS, there would be limited perceived risks in relation to implementing a new TPS. As part of our offering, the current Eclipse TPS system will be upgraded to our most up to date version 16.1 which includes the maintenance of existing data and new features and functionality that are included within our offering. Eclipse upgrade applications training will be included to ensure the knowledge base of the staff is up to date with the new features included in version V16.1. **Fully Integrated Eco-system** Modern radiation treatment delivery also relies on the coordination of complex computerized systems to exchange treatment information. Whether the devices and software in a department are manufactured by a single vendor or by multiple vendors, data transfer between these systems is accomplished through a variety of internal and external interfaces. Despite these measures, it is possible that data may be unintentionally modified during transfer, and that such a change may go unnoticed. The situation may be further complicated by the fact that various devices use their own internal data models and interpretations so conversions from the standard formats may be required. Eclipse is fully integrated within the Varian Eco-system offering the advantage of a seamless workflow that can reduce data transfer errors and raises the bar for patient safety. In a Varian environment, Eclipse and ARIA® oncology information system share a unified database, so any patient or plan present within ARIA will be automatically available in Eclipse without any user interaction. As part of our offer, a clinical implementation support package to enable NHS Lothian to expand their use of the OIS and TPS and introduce paperless working which will have multiple benefits such as streamlined and efficient workflow, greater visibility of the patient pathway and enhance quantitative data entry into the OIS/TPS which consequently enables the NHS Lothian team to review and analyse their own data to support proactive changes in all areas of the department. Clinical Solutions Support: Varian's clinical solutions support team will provide Edinburgh Hospital with bespoke project management, support and guidance in creating, training and managing the use of Varian software to enable the team at Edinburgh Hospital to enhance their working and obtain the benefits this will provide. Comprehensive training plan: As part of a new OIS and TPS purchase Varian will provide dedicated onsite application training as well as attendance to Varian's classroom training courses. **Benefits of workflow optimization:** • Increased visibility of progress and documentation along the patient pathway with automatic task generation after electronic completion, which can be done via ARIA. Possibility of reduced patient pathway with ease of access to information across sites. Ease of access to patient information by wider care team across Edinburgh Hospital, improving communication and ability to make informed timely decisions. • Enhanced radiation safety and quality features to limit the risk of errors.	

- Utilising an integrated workflow from TPS to OIS enables the department to enhance radiation safety with features such as prescription and plan linking to automatically unapprove a treatment plan if the prescription is altered, plan integrity check at the treatment machine to verify the plan signature and plan parameters remain the same as the time of approval, no manual DICOM import/Export of plans avoiding transcription errors.
- Optimized plan generation with the use of RapidPlan to promote standardization of plans and improved quality.

Key benefits in the TPS workflow:

- Reduce variability and improve efficiency and plan quality for IMRT and VMAT plans: support is included to build site specific RapidPlan models to standardise and automate the optimization process.
- Decision support for complex plans: Implementation of MCO to explore trade-offs in real time for complex sites.
- Streamlined Off-line adaptive workflow: Implementation of an efficient off-line adaptive workflow using a combination of ARIA/Eclipse and Velocity.
- Implement a robust peer review workflow, without initiating delays in the planning pathway.

Proposed IT Infrastructure Benefits

Our offer includes providing a virtualised system for the OIS and TPS to run on. A key benefit of this solution is the provision of disaster recovery and backup with an uninterruptable power supply for each set of nodes is supplied, this will provide up to 15 minutes of uninterrupted power in the event of a power cut, to allow for safe shutdown of the platform.

All day-to-day management of the virtual machines can be carried out using VMware vCenter, VxRail which is integrated directly into the system. The solution does not use complicated external storage arrays.

Varian will provide a team of engineers to complete the works either in-hours or out of hours dependent on the client requirement. Project management will be provided by Varian and its IT partner for the duration of the project to ensure scope, time and cost requirements are adhered to. The PM will also act as a point of escalation, if required.

Please refer to the support document ***Varian-Edinburgh VxRail Statement of Works.pdf*** full details of the offer and scope of project included in the virtualisation.

Speed and Efficiency

Eclipse offers speed and potential increase in efficiency to your clinic, with its GPU technology that helps decrease waiting time for dose calculations, which means treatment planners can perform their tasks faster.

In Eclipse V16.1, users can use the Graphics processing unit (GPU) for IMRT and VMAT dose optimization and final dose calculation with Acuros XB, to improve optimization and dose

calculation performance. 4 x dedicated FAS servers with 4 GPU cards in each FAS have been included within the IT Infrastructure as part of this tender. AcurosXB by its very nature will calculate a plan faster than an equivalent AAA setup. Empowering the Eclipse system with Graphics Processing Units (GPU) will maximize and drastically reduce the calculation and optimization times of the planning processes.	

4.2.10 Support contract

A fully comprehensive support contract which satisfies the following requirements should be offered to apply for a period of 3 years following expiry of the warranty.

The contract should provide for resolution of all software and hardware faults. A separate option should be provided for the additional provision of all major updates to software.

For systems with hardware installed locally at the ECC, the contract should provide for all spare parts coverage. If certain component parts are excluded from the proposed support contract, these must be specified.

Technical support and advice by telephone and will be available by telephone, free of additional charges, and without limitation, from 08:30 to 18:00, Monday to Friday, for the lifetime of the equipment. This excludes Christmas Day and New Year's Day.

Remote access computer support must be provided to facilitate fault investigation and resolution. Details should be provided of how these facilities are provided including confirmation of relevant NHS network connectivity agreements

Contractor Response. Fully complies Essentials support contract quote will be provided which entitles the Board to all major and minor updates. Please note that as this is an integrated system the contract would need to cover all components. Under the terms of the Contract, Technical and Applications telephone support will be provided 8:00am to 6:00pm Monday to Friday excluding public holidays for the period of the contract. **Help Desk Technical (HTST) Support:** during the Contract period Varian's help desk specialists will provide technical support for the covered Equipment. Support is available by telephone, through the MyVarian portal, and e-mail during Varian's standard hours. **Remote Support:** during the Contract period Varian will provide remote support during Varian's standard hours for service of a defect to facilitate fault investigation and resolution.	(E)

4.3 Information required

Bidders should provide detail of the network connectivity requirements for the proposed solution indicating: -

a. Number and type of connections required in each location
b. Connection speed/minimum bandwidth required for functionality over
    i. local area network

ii. wide area / SWAN networks

(I) provide details Each workstation would need 1x network connection via rj45 standard. Minimum network requirements for LAN: 100Mbps recommended 1Gbps. Minimum network requirement for remote users: 5Mbps line over hospital VPN.

There should be a clear identification of what hardware is included in the tender submission and that which is optional. All optional items should be clearly identified. All hardware to be supplied as part of the tender should be clearly identified. Details of processors, graphics cards, memory and disk storage should be provided along with any network interfaces

Please provide details. The offer includes the option to purchase 30 workstations plus monitors. The workstations would be a Dell Optiplex XE3 SFF with the following specification: • Dell Optiplex XE3 Small Form Factor • Win10 IoT Enterprise 2016 LTSB 64bit "High End" COA • 8GB DDR4 UDIMM Non-ECC • 1 x Intel Core i7-8700 (6 Cores, 12MB, 12T, up to 4.6GHz) • 1 x Intel UHD Graphics 630 (integrated) • 1 x DVD +/-RW Optical Disk Drive • 1 x 512 GB Class 20 (or higher) SSD • 1 x Dell Mouse • 2 x Display Port to DVI Adapter • 39 Month pro support Next Business Day • For Europe Configuration use EURO Power Cord • For US Configuration use US Power Cord Depending on the time of order fulfilment, the aforementioned may vary slightly and immaterially from the foregoing.	(I)

Details of the workstation monitors should be provided, including viewable screen dimensions & aspect ratios, colour depth, use of multiple screens and facilities for drawing ROIs etc.

Please provide details. DISPLAY • Viewable Image Size 27" • Aspect Ratio 16:9 • Native Resolution 2560 x 1440 • Brightness (typical) 350 cd/m2 • Response Time (typical) 8 ms (GtG) • Displayable Colours 1.07 billion out of 4.3 trillion • Input Connectors DisplayPort, mini DisplayPort, HDMI (2), USB Type-C	(I)

POWER CONSUMPTION On (typical) 50W • Power Savings Mode (ADVANCED) 0.5W • Power Delivery The PA271Q delivers 30W over USB Type-C PHYSICAL SPECIFICATIONS Dimensions (WxHxD) • Net (with stand) 25.2 x 15.6 - 21.5 x 9.2 in. / 640.2 x 395.7 - 545.7 x 233.0 mm • Net (without stand) 25.2 x 14.9 x 2.6 in. / 640.2 x 378.6 x 65.4 mm Weight • Net (with stand) 21.4 lbs. / 9.7 kg • Net (without stand) 15.2 lbs. / 6.9 kg • VESA Hole Configuration 100 x 100mm ENVIRONMENTAL CONDITIONS • Operating Temperature 41-95°F / 5-35°C • Operating Humidity 20 - 80% • Operating Altitude 16,404 ft. / 5000m • Storage Temperature 14-140°F / -10-60°C • Storage Humidity 10-85% • Storage Altitude 40,000 ft. / 12,192m • Tropical Environments Yes	

Details of the operating system(s) used by the TPS should be provided (servers and clients). The computer operating system should be able to be supported for the lifetime of the planning system, or upgraded as required. There should be a clear identification of what operating system & network access licences are included in the tender submission.

Please provide details. All servers will be running Windows server 2016 or newer. All clients will be running Windows 10 X64.	(I)

Details of additional software expected / required to be installed on the servers / clients should be provided. It should be noted that the Health Board's current Anti-Malware solution is CISCO AMP and their Encryption solution is Becrypt for laptops and Ivanti for USB devices.

Please provide details. None other than the ones reported above.	(I)

Details of DICOM compliance and any interfaces or drivers should be provided. Where appropriate, the format in which images and data are stored should be identified and described.

Details of the capability of an HL7 connection to a Hospital Information System (Trak) should be identified and described.

Contractor response. In Eclipse, storage of patient, plan and image data takes place via DICOM format. When the command to export or import items is chosen, the DICOM Import Export application is started. To be able to export and import data, it is necessary to configure export and import filters corresponding to the data to be transferred. The filters can be configured to import from a local or network folder, a DICOM storage device or from a portable media device. **Overview of Import and Export Features** • Planar images (all types) • CT data sets • DECT data sets • 4DCT data sets • Synthetic MR datasets • RT plans • Treatment records (incl. RT brachy) • RT Ion • RT dose (except for planar dose, which can only be exported from Eclipse) • RT structures • Registrations • Deformable registrations • Motion management protocols and waveforms • Networked query/retrieve and storage • Matrix frame grabber • VIDAR scanner • Bitmap/JPEG/TIFF In Eclipse, import and export of patient, plan and image data takes place through the DICOM Import Export application. When you choose the command to export or import items, the DICOM Import Export application is started. To be able to export and import data, you can configure export and import filters corresponding to the data to be transferred. The filters can be configured to import from a local or network folder, a DICOM storage device or from a portable media device. This application is designed to import and export objects of a patient which provides comprehensive, scalable and easy-to-use DICOM functionality through all of Varian's product lines. Furthermore, it provides import and export of non-DICOM image formats, like JPEG, TIFF, and BMP. It supports image acquisition/import through external devices by scanning or frame grabbing. Connectivity to DICOM compliant SCU/SCP services are supported. This allows DICOM Query/Retrieve and DICOM Storage operations to 3rd party devices, like PACS (Picture Archiving and Communicating Systems) or CT scanner software. Additionally, the external contour of the patient is automatically created during import. The application also offers the possibility to anonymize patient data when exporting Patients. Eclipse does not require any additional licenses to communicate with DICOM compliant devices.	(I)

HL7 connections offered include:

Patient Demographics:

ARIA Connect would accept inbound ADT HL7v2.x messages. ARIA Connect would respond with the appropriate ADT HL7v2.x acknowledgement messages, scheduled according to the system requirements.

The specification of the messages can be found in the support document ***ARIA Connect Demographics Inbound Interface Spec Guide.pdf***.

Patient demographics can be easily selected using the patient select function and registration workspace.

This workspace provides all demographic information pertaining to the patient. The information which can be entered/populated includes:

- Name, Date of Birth, Sex, Preferred name, race, language, occupation
- Contact details (email, phone x3)
- Address
- Patient IDs
- Emergency contact details – Multiple contacts can be added including: name, address, contact, relationship and entrusted contact status.
- Employer/School details
- Transport details
- Primary oncologist can be assigned and viewed.
- Referring Dr can be assigned and viewed.
- Patient status (New/Previous patient)
- Insurance details can be added if applicable.

Documents:

ARIA Connect provides an interface for exporting messages for processing the documents (MDM - Medical Document Management).

The ARIA Connect HL7 MDM (Document) Outbound interface provides the following features:

- Exports patient documents
- Supports reference pointers in OBX-5
- Converts exported document to PDF, PDF/A1, PDF/A2 and Base64
- Supports account number association
- Supports addendum via MDM^T06
- Supports MLLP and File-based communication modes

The MDM Outbound interface allows filtering of notifications based on message data attributes, for example, Document Type, Template Used, Document Status and Author ID. This interface can be configured to split one or more large OBX segments into smaller segments.

ARIA Connect manages ARIA documents using an HL7 MDM (Medical Document Management) interface. When MDM messages are received from an external system, ARIA Connect imports, updates, or amends the documents in ARIA. ARIA Connect MDM Inbound interface provides the following features: • Creates and updates patient documents • Supports reference pointers in OBX-5 • Supports all ARIA dynamic document formats • Supports account number association • Supports addendums via MDM^T06 The inbound HL7 messages must contain one or more identifiers that uniquely describe the patient record. Matching inbound patient identifiers ensure that the documents are attached to the correct intended patient. **Scheduling:** ARIA Connect can export appointments to an external system. All the created messages follow the HL7 2.5.1 Standard. Appointment creation, updates to the appointment including change of duration, rescheduling, cancellation, and deletion events are exported real time. After these events occur in ARIA, ARIA Connect generates and sends the HL7 messages. The interface exports a single SIU message per appointment. ARIA Connect can receive SIU appointment messages from an external system, when the appointment is created using the interface the configured tasks and questionnaires also get attached automatically. The inbound HL7 SIU messages must contain one or more patient identifiers that uniquely identify the patient record. These patient IDs are used by ARIA Connect to match and update patient appointment related information. The interface provides configuration to define mapping between Patient IDs from HL7 message and IDs configured in ARIA.	

Please supply details of any special hardware/architecture employed to facilitate the calculation of plans in an acceptable timescale (e.g. distributed processing / GPUs).

Please provide details. In Eclipse, users can use the Graphics processing unit (GPU) for IMRT and VMAT dose optimization and final dose calculation with Acuros XB, to improve optimization and dose calculation performance. 4 x dedicated FAS servers with 4 GPU cards in each FAS have been included within the IT Infrastructure as part of this tender. An estimated length of time for the final dose calculation of a 360° dual arc VMAT head & neck treatment with 2-degree control points and 100 CT slices would take on a dose grid spacing of ≤ 2mm would be <20 secs using Acuros XB and GPU. The scenarios listed give approximate optimization and calculation times to be expected:	(I)

1. Manual optimization

- Head and Neck treatment, 3 dose levels, Manual optimization: **5m03s**
- 70 Gy, 30 fractions, 2Gy/fraction, Second dose levels for PTV2: 60 Gy, Third dose level for PTV3: 54Gy.
- 6X, 600 MU/min, TrueBeam
- VMAT Technique, 2 full arcs
- Acuros Final Dose calculation, 0.25 cm resolution, GPU Enabled
- Photon Optimizer algorithm, 0.25 cm resolution, GPU Enabled
- Plan created with manual workflow, no template or clinical protocols used.
- Optimization done with 16 different objectives and NTO, all added manually.

2. Automated optimization with RapidPlan

- Head and Neck treatment, 3 dose levels, RapidPlan: **3m30s**
- 70 Gy, 30 fractions, 2Gy/fraction, Second dose levels for PTV2: 60 Gy, Third dose level for PTV3: 54Gy
- 6X, 600 MU/min, TrueBeam
- VMAT Technique, 2 full arcs
- Acuros Final Dose calculation, 0.25 cm resolution, GPU Enabled
- Photon Optimizer algorithm, 0.25 cm resolution, GPU Enabled
- Plan created with manual workflow; no clinical protocols used but with RapidPlan-ML automated optimization tool.
- Done with 26 different objectives and NTO

Speed and Efficiency

Eclipse offers speed and potential increase in efficiency to your clinic, with its GPU technology that helps decrease waiting time for dose calculations, which means treatment planners can perform their tasks faster.

In addition, complex calculations in Eclipse such as dose distribution calculation and dose volume optimization, are performed using the Distributed Calculation Framework (DCF). The DCF offers Eclipse the ability to calculate the dose or optimize using external processes. These processes can run on the same workstation as Eclipse, on some other workstations in the network, or both.

The AAA algorithm was designed to make the most out of this parallelization, meaning our dose calculation framework will scale with your current and future hardware.

AcurosXB by its very nature will calculate a plan faster than an equivalent AAA setup. Empowering the Eclipse system with Graphics Processing Units (GPU) will maximize and drastically reduce the calculation and optimization times of the planning processes.

Please describe any support which would be available to assist the Cancer Centre in installation, commissioning (including data acquisition) and customisation of the treatment planning and delivery systems.

Contractor Response: The Installation of our offered software will be supported by a Varian project manager and Installation team. As the team at ECC are already using the Eclipse TPS for treatment planning, no new data acquisition or commissioning will be required as a result of this tender. As part of this tender offering, Clinical Implementation support is offered to support the Cancer Centre in the customisation of the OIS and TPS as well as support the implementation of the features and software included in our offer. Please see the support document ***NHS Lothian Training Requirements.pdf*** for further information. Please see below training included within our offer and details of the Clinical Solutions Implementation package. **Eclipse Treatment Planning System** **Upgrade Training** Online video training and Q&A will be provided in relation to the new features in the Eclipse TPS upgrade. The training is on demand and should be completed prior to the system conversion to ensure safe and effective use of the new Eclipse features. Duration: 70 minutes Go-Live Support: 1 day onsite and remote Typical Group Size: Individual all users with a MyVarian Account can access for up to 90 days **AI -Rad Companion Organs RT** Online product training videos will be provided to assist teams to embed these tools into their clinical workflow. **Multi-Criteria Optimization [MCO] Training** 1 day on-site (or remote) training for physicists involved in the implementation and daily use of Multi-Criteria Optimization / Trade-off Analysis. Users will already need to be experienced with IMRT and RapidArc planning in Eclipse prior to this session. Typical group size: between 5-7 attendees **Velocity Training** Remote workshop for a group of staff 1.5 days: including, Consultants, Physicists and Radiographers. Training is included with the purchase of Velocity. Training plan details will be provided by the training management team as part of your product implementation process. **Standard training for RT Peer Review** **Features:** **Topics covered include:** • Preparing patients and plans for review session • Reviewing patients • Capturing output of review • Export the Review Report o History of Review Sessions	(I)

Duration and Location: 1 hour of remote training or as part of onsite upgrade training depending on software version or system configuration.
Prerequisites: RT Peer Review must be installed and accepted
Customer Responsibilities: Must have access to a phone and a computer with internet connection for remote session.
Notes: Offer is valid for up to 18 months after installation of product.

RapidPlan Clinical Implementation Class

3 day Education class: although previously conducted at Varian's European Education Centre in Switzerland, at the time of writing, the class is being conducted online.
1 seat included with Phase 1 only.
Target Audience: experienced Eclipse planning physicist with responsibility for subsequently implementing RapidPlan.

The course covers the following main topics:

- Introduction to RapidPlan.
- Applying Varian provided RapidPlan models.
- Custom models configuration and DVH estimation algorithm.
- Creation of a Prostate Model including training, verification, use of Model Analytics tool and validation.
- Creation of a Head and Neck Model including training, verification, use of Model Analytics tool and validation.

After the class has been completed, there follows an in-house implementation phase. To round off, there is a 1 day on-site (or remote) session to help look at the locally created models.

HyperArc (offered as optional Licences)

Training and support for HyperArc is multi-staged:

- External training (from QFix) on the Encompass immobilisation system used in HyperArc.
- 2 days of on-site/remote Eclipse training on the HyperArc planning aspects and example demo/video of a HyperArc plan delivery on TrueBeam.
- External consultancy for HyperArc implementation support.

The Radiotherapy department at Western General Hospital are embarking on a tender process for a new OIS and TPS system. The radiotherapy department at Western General Hospital currently have Varian linear Accelerators, Eclipse TPS and ARIA OIS. As part of this tender process we recommend the team at Western General Hospital take this opportunity to optimize their treatment planning, develop paperless workflow to enable the team to move away from the current reliance on paper records and the use of multiple systems which currently do not communicate with each other, which will support the team in aiming to reduce the patient pathway and utilize enhanced planning features to take advantage of the enhanced safety and efficiency features this will bring. When embarking on a large-scale project of implementing advanced planning features and streamlined paper lite workflow this highlights challenges of a physical hardware environment which could benefit from cloud-based services or virtualisation.

As part of this project Varian will demonstrate the ability to provide solutions to these challenges and those posed by introducing an optimized workflow. The following

implementation support is based upon the priorities of Western General Hospital. The Varian Clinical Solutions team have discussed the key objectives and current OIS and TPS workflow of the radiotherapy department at Western General Hospital, to ensure that we can provide suitable recommendations and support for the Implementation of OIS and TPS and Workflow Optimization. **Implementation Plan overview** Support the development of workflows that embed the utilisation of Rapid Plan, MCO and Velocity within daily clinical practice in the Radiotherapy planning department: • Aim to improve the quality, efficiency and consistency in the optimization process, by building a site specific RapidPlan model and to expedite the benefits of MCO in the treatment planning workflow for more complex cases. • Streamlining the offline adaptive pathway and decreasing time taken to both decide on and generate replans, harnessing the benefits of both Velocity and RapidPlan. • Implementation of the advanced deformable image registration and contouring tools. ***Phase 1: Finalise Clinical Application of Tools, Associated Workflow Design & Configuration*** • Detailed workflow analysis and current process mapping of site-specific planning workflows. • Define the scope and clinical goals for RP models. • Workshop to present the proposed future "to be" workflow options. • Model creation, training analysis and validation. • Exploration of benefits of MCO to further fine tune dose distribution of validation plans. • Assessment of current off-line adaptive workflow and analysis of future goals. • Remote support to finalise future workflows. ***Phase 2: Cascade Training & Preparation for Implementation*** • Cascade training plan development and analysis of validation test plans. • Develop off-line adaptive workflow and decision tree development. • Conduct multi-disciplinary change management workshops. • Remote support to review cascade training plan, content and progress. ***Phase 3: Site Readiness & Go-Live Support*** • Go-live support • Remote support to support for go-live queries	

Any supporting equipment will be supplied by the Board beforehand.

Contractor Response: Noted and agreed.	(I)

Prior to delivery of the equipment, the Health Board must be supplied with a complete list of all items to be delivered with information on package sizes and weights.

Contractor Response Noted and agreed to provide full information about all items with package size and weights for delivery.	(I)

Pre-installation site examinations, delivery and installation of the equipment shall be free of any additional expense to the Health Board. The Contractor must provide any special transport, lifting or handling equipment

Contractor Response Noted and agreed – we will deliver the equipment to the appropriate location/s.	(I)

The fabric and fittings of the building must be protected at all times during delivery and installation. Any special requirements or arrangements, which the Contractor requires the board to undertake, must be notified to the Health Board in writing at least four weeks before delivery and/or installation commences.

Contractor Response Noted and agreed.	(I)

Dates for delivery of the equipment and dates and duration of the installation will be agreed by the Health Board with the Contractor and confirmed in writing. In each case the equipment must be delivered or installed within 6 weeks of the agreed date. Written notification must be given of any equipment that will be delivered at a later date than that for the main system.

Contractor Response Noted and agreed.	(I)

Please indicate the likely number of software releases per year and describe how customers will be informed of the software update availability.

Contractor Response. Varian will continue to add functionality to enhance the Eclipse product based on customer feedback, product ideas and technology requirements. Any major version released in the warranty period would be offered.	(I)

5. Stereotactic Radiotherapy / Radiosurgery (SRT/SRS)

[redacted]

5.1 Mandatory requirements

5.1.1 Data Protection

The solution must be fully compliant with EU General Data Protection Regulation (GDPR).

(M) confirmation required

5.1.2 eHealth Standards

The Bidder must adhere to all NHS Scotland eHealth standards, policies and guidelines in respect of data definitions, NHS Scotland information governance, technical operation and security.
http://www.ehealth.nhs.scot/resources/standards-library/

The solution must adhere to the NHS Scotland Server Vulnerability and Patch Management Policy. Government legislation also requires the NHS to adhere to Network and Information Systems Regulations (NISR) and Cyber Essentials. We use Ivanti device and application control for managing USB connected devices

(M) confirmation required

5.1.3 Audit trail

The system should provide an audit trail of all transactions, including:

- Facilities to enable the post-event identification of specified event (e.g. attempts to gain unauthorised access to information, failed logins) including times and user ID's involved and to produce reports accordingly

- A complete Audit trail of all edited values in all records including; user identifier, workstation identifier, date & time of change, original value and new value so that it is possible to derive the original and any intermediate state of any record and details of the changes as well as read access.

- A full audit trail of where samples have been (route history)

It should also be compatible with NHS national Fairwarning system

(M) confirmation required

5.1.4 Minimum components and technical capabilities

All hardware, software and licenses required, remote access within the hospital network and outside the hospital network, user control and authorisation to be provided. It must have a high level of availability and resilience. The resilience of each component of the solution they are providing, i.e.

Hardware, Software, Database, Interfaces etc. must be identified. Include a test system, where configuration changes and upgrades can be tested before clinical implementation; and provide a remote support capability. Remote access to the system for maintenance and problem resolution must be via NHS SWAN.

(M) confirmation required

5.1.5 Minimum planning requirements

It must have the capability to undertake target delineation, treatment planning and plan review across other clinical locations within NHS Lothian and home working.

Contractor Response	(M)

It must be able to utilise a frameless stereotactic system with an accuracy of less than 0.5mm and 0.5°.

Contractor Response	(M)

It must be able to perform image registration of MR, MRA, CT and CT-A to the level of the above precision.

Contractor Response	(M)

It must to be able to import, register and contour fluoroscopically acquired 2D Digitally Subtracted Angiograms with and without immobilisation.

Contractor Response	(M)

It must be able to treat small field sizes from ≥5mm effective field size

Contractor Response	(M)

Intensity modulation SRT is essential to deliver conformal treatments for larger lesions (>20mm)

Contractor Response	(M)

It must provide high conformality, with a conformality index < 1.3

Contractor Response	(M)

It must have a rapid dose fall-off to approximately 20% within 20-30 mm for single lesions.

Contractor Response	(M)

It must be customisable to provide bespoke plans for a variety of complex cranial lesions.

Contractor Response	(M)

It must be able to use customised treatment parameters such as gantry angles and couch angles to minimise normal tissue dose including consideration of total body dose.

Contractor Response	(M)

It must have the capability of splitting a multiple metastases plan into several isocentres, when deemed clinically appropriate.

Contractor Response	(M)

5.1.6 Minimum compatibility

Export must be compatible with all OMSs and the plans must be able to be treated on our current LinAcs (Varian Truebeam & Novalis), Exactrac 6.2, and our SRS quality assurance equipment. See Tables 1 to 4 above.

Contractor Response	(M)

It must be able to export to BrainLab ExacTrac and import both volumetric and planar Angiography from the Department of Clinical Neuro-sciences at Edinburgh Royal Infirmary in particular, and other digital interventional DICOM angiography suites in Scotland in general.

Contractor Response	(M)
[redacted]	

The TPS must be compatible with 16-bit CT scans.

Contractor Response	(M)

The above criteria must be met in order for us to maintain our current treatment protocols. Treatment delivery must be capable of delivering in a time efficient manner and we must maintain the ability to acquire off-axis imaging when clinically appropriate

Contractor Response	(M)

5.1.7 Retention of Data

The offered product must include the conversion and transfer of the all the data stored in the Board's existing DA system's database into the new offered system.

Contractor Response	(M)

5.1.8 Continuity of Service

It is essential that the Board continues to provide a clinical service to its patients, even during the installation and implementation of the offered Products. The Contractor must explain how the offered Products will be installed and implemented without interruption of the Board's clinical service. A full and detailed plan for the installation and implementation of the offered Products must be presented and be acceptable to the Board.

(M) confirmation required

5.1.9 Technical information

Copies of full technical documentation must be provided for all components of the DA hardware, software and any third-party equipment, including operator's manuals, administrator's manuals and technical manuals describing the system configuration and operating procedures. All system documentation including that for subsequent software revisions must be in English and clearly labelled with the version number and release date. A detailed acceptance protocol covering both supplier and customer aspects must be provided.

(M) confirmation required

5.1.10 Additional fees

The offered Products should be free from any additional fees or software subscriptions that are required for the use of the Products. Furthermore, the Board should not be required to purchase a service contract in order to have full use of the offered Products.

(M) confirmation required

5.1.11 Minimum Requirements for Training

In order to comply with statutory requirements, it is essential that all necessary staff are trained in the use of the new DA (including system operation, commissioning, system administration / configuration, physics support, imaging, maintenance/repair, quality assurance and clinical implementation).

All training offered must be identified. Details must include which staff group the training is for and the period of time on site. There must be no additional costs for any core training provided off site. Optional training courses, whether on or off site, must be described and costs identified. Contractors must provide information on their recommendations for training of the various multi-disciplinary groups on the basis of discussions with Health Board representatives.

(M) confirmation required

5.1.12 Minimum Requirements for Equipment Warranty & Support Services

A warranty, commencing from the date of acceptance for the TPS will be provided. The period of the warranty will be twenty-four (24) calendar months from Acceptance. This warrants all modules, components and parts such that any failure during the period of the warranty would be replaced at no extra cost to the Health Board. During the warranty period, the Contractor will rectify faults, as detailed in the Agreement, within the timescales laid out in the Agreement. The Contractor's Engineer will attend on site, at no cost to the Health Board, if required to meet these conditions.

Remote access computer support must be provided to facilitate fault investigation and resolution and should be stated. Details should be provided of how these facilities are provided including confirmation of NHS network connectivity agreements.

Servers should be provided with a minimum 5-year manufacturer's warranty and clients with a minimum 3-year manufacturer's warranty unless other arrangements for support are offered.

Following expiry of the warranty period, the Health Board's staff or other third parties may undertake the service and repair of the TPS hardware. Any parts of the equipment, which must not be calibrated, serviced or repaired by Health Board staff or third parties must be stated.

(M) confirmation required

5.2 Evaluated items

5.2.1 Servers and network infrastructure:

The offered Products must include the underlying IT infrastructure that enables full functionality. This includes the computer servers, network devices and supporting software that: store data and images; manage user logins and credentials (e.g. domain controllers); permit user access to the TPS software (e.g. via Citrix); provide backup functions; continuous power supply (e.g. UPS); etc. The ECC has existing structured cabling and any required changes or upgrades to the cabling should be included in the offered Products. However, bidders must confirm that they accept the principle of NHS Lothian, Fife and Borders procuring workstation and server hardware for the proposed system through existing NHS Scotland or alternative Government / Public Sector framework contracts.

If the Contractor proposes retaining items from the Board's existing TPS, the description should explain how the new and retained items will work together to achieve the requirements. In particular, the Contractor's response should include a description of the capacity of the system, such as number of users who can connect simultaneously (e.g. via Citrix and/or locally), storage capacity (e.g. in terms of number of CT scans), network speed, etc. Also the details of the backup process/software and media, such as network attached storage – ideally, the backup solution should be as automated as possible and not involve the manual exchange of tape cassettes. The backup must include patient-related data, user-related data, configuration and system set-up data.

The solution must offer disaster recovery functionality. In the event of failure, the system must automatically retain data / results and allow this to be retransmitted. The ability to manage upgrades in a way which minimises disruption for the service must be provided. Any limitations running in a Dynamic Host Configuration Protocol (DHCP) environment should be stated.

(E) provide details

5.2.2 Client workstations:

The offered Products must include the computer workstations ('clients') that are required for operators to access the TPS system. These clients need to be distributed throughout the ECC. Most of the Board's existing TPS system clients are over 5 years old and the Board wishes to replace them. There is a requirement for 60 new workstations in total, or an adequate amount to cover our needs for up to an 8 linac department. This should include our remote needs. Any solution requiring remote connection software must include the necessary software licenses as part of the cost of the offered Products. If any of the Board's existing software licenses (e.g. Citrix) are to be retained in order to provide a portion of the requirement, this should be explicitly stated along with the number of new licenses that will be included in the offered Products.

The client display screens should be of sufficient quality to review medical images, such as radiographs and CT scans.

The Contractor should provide details of client workstations to be provided with the offered products and describe how the client workstations included with the offered Products will achieve the required access, capacity and functionality.

(E) provide details

5.2.3 Third party software:

The offered Products must include all third-party software needed to realise the full functionality of the system. The Contractor should confirm acceptance of this requirement and explicitly state which, if any, of the Board's existing software licenses will be retained.

(E) provide details

5.2.4 Planning requirements

We must be able to import, register and outline 3D and 4D angiography acquired with the patient in the treatment immobilisation, and also when acquired without immobilisation

Please provide details:	(E)

A type-II algorithm is highly desirable.

Please provide details:	(E)

An MR distortion correction is desirable.

Please provide details:	(E)

It must be compatible with Varian SRS cones.

Please provide details:	(E)

There should be the capability of planning intensity modulated SRT.

Please provide details:	(E)

We would like details of the capability of reporting tools in order to audit patient treatment. The ability to query on plan parameters (doses to PTVs/OARS) and treatment details (treatment dates and fractions) by patient demographics (ID, address and/or diagnosis)

Please provide details:	(E)

5.2.5 Paperless working:

The Board aims to use paperless workflows more extensively. The Contractor should describe the functionality of the offered Products, as it relates to these requirements, as well as how, and to what extent, the offered Products meet this requirement.

(E) provide details

5.2.6 Future Developments

In respect of the TPS to be supplied to the Health Board, Contractors should provide full details of their participation in IHE Connectathons, planned releases and development areas proposed for the period of twenty-four (24) months from submission of their Tender, and state likely implications for any computer hardware and software specifically identifying any implications for existing radiotherapy equipment in use by the Health Board.

Contractor Response:	(E)

5.2.7 Benefits, Risks & Consequences of Change

Radiotherapy treatment delivery is a complex, multi-stage process incorporating many inter-related stages of booking, simulation, planning and treatment and draws on multiple, specialised human and technical resources. The Health Board has an existing set of protocols and work processes that have been developed to deliver a safe service and the benefits, risks and consequences from implementing new equipment and software need to be assessed as part of this tender.

The SRT TPS is a core component of the radiotherapy clinical pathway. Radiotherapy Physics staff are involved in localisation, beam modelling and the creation of documentation using the TPS. Therapy Radiography staff carry out treatments based on documentation produced by the TPS, while clinical staff localise targets, assess dose distributions and prescribe the final radiotherapy treatment based on the TPS facilities and output.

The Contractor must provide sufficient details to allow assessment of the consequences and/or risks of implementing their offered TPS to the Health Board as part of their bid. Details to be provided include the compatibility with the existing knowledge base and skill set of staff in each of the areas noted above, and the estimated time to educate for new features and functionality, the overall length of training, and the clinical implications from the potential delay in implementing new features. The Contractor should indicate the expected benefits to be gained from introducing this functionality and feature set, particularly those areas identified in the General Introduction of this document.

In addition, the Contractor should provide technical details of any arrangements to facilitate migration, or integration, of patient planning information stored within the department's existing treatment planning system into the patient planning information storage system of the tendered equipment.

Contractor Response	(E)

5.2.8 Support contract

A fully comprehensive support contract which satisfies the following requirements should be offered to apply for a period of 3 years following expiry of the warranty.

The contract should provide for resolution of all software and hardware faults. A separate option should be provided for the additional provision of all major updates to software.

For systems with hardware installed locally at the ECC, the contract should provide for all spare parts coverage. If certain component parts are excluded from the proposed support contract, these must be specified.

Technical support and advice by telephone and will be available by telephone, free of additional charges, and without limitation, from 08:30 to 18:00, Monday to Friday, for the lifetime of the equipment. This excludes Christmas Day and New Year's Day.

Remote access computer support must be provided to facilitate fault investigation and resolution. Details should be provided of how these facilities are provided including confirmation of relevant NHS network connectivity agreements.

Contractor Response.	(E)

5.3 Information required

Bidders should provide detail of the network connectivity requirements for the proposed solution indicating: -

a. Number and type of connections required in each location
b. Connection speed/minimum bandwidth required for functionality over
    i. local area network
    ii. wide area / SWAN networks

(I) provide details

Any additional hardware/equipment which would be required to enable us to use our imaging and equipment must be indicated and costed

Contractor Response	(I)

We also require a solution for the planning and treatment of multiple metastases which enables minimal dose bridging between lesions and the manufacturer must comment on how this is achieved.

Contractor Response	(I)

There should be a clear identification of what hardware is included in the tender submission and that which is optional. All optional items should be clearly identified. All hardware to be supplied as part of the tender should be clearly identified. Details of processors, graphics cards, memory and disk storage should be provided along with any network interfaces

Please provide details.	(I)

Details of the workstation monitors should be provided, including viewable screen dimensions & aspect ratios, colour depth, use of multiple screens and facilities for drawing ROIs etc.

Please provide details.	(I)

Details of the operating system(s) used by the TPS should be provided (servers and clients). The computer operating system should be able to be supported for the lifetime of the planning system, or upgraded as required. There should be a clear identification of what operating system & network access licences are included in the tender submission.

Please provide details.	(I)

Details of additional software expected / required to be installed on the servers / clients should be provided. It should be noted that the Health Board's current Anti-Malware solution is CISCO AMP and their Encryption solution is Becrypt for laptops and Ivanti for USB devices.

Please provide details.	(I)

Details of DICOM compliance, and any interfaces or drivers, should be provided. Where appropriate, the format in which images and data are stored, should be identified and described.

Contractor response.	(I)

Please supply details of any special hardware/architecture employed to facilitate the calculation of plans in an acceptable timescale (e.g. distributed processing / GPUs).

Please provide details.	(I)

Please describe any support, which would be available to assist the Cancer Centre in installation, commissioning (including data acquisition) and customisation of the treatment planning and delivery systems.

Contractor Response:	(I)

Prior to delivery of the equipment, the Health Board must be supplied with a complete list of all items to be delivered with information on package sizes and weights.

Contractor Response	(I)

Pre-installation site examinations, delivery and installation of the equipment shall be free of any additional expense to the Health Board. The Contractor must provide any special transport, lifting or handling equipment

Contractor Response	(I)

Dates for delivery of the equipment and dates and duration of the installation will be agreed by the Health Board with the Contractor, and confirmed in writing. In each case, the equipment must be delivered or installed within 6 weeks of the agreed date. Written notification must be given of any equipment that will be delivered at a later date than that for the main system.

Contractor Response	(I)

6. DICOM Archive (DA)

6.1 Mandatory requirements

6.1.1 Data Protection

The solution must be fully compliant with EU General Data Protection Regulation (GDPR).

(M) confirmation required

[redacted]

6.1.2 eHealth Standards

The Bidder must adhere to all NHS Scotland eHealth standards, policies and guidelines in respect of data definitions, NHS Scotland information governance, technical operation and security.
http://www.ehealth.nhs.scot/resources/standards-library/

The solution must adhere to the NHS Scotland Server Vulnerability and Patch Management Policy. Government legislation also requires the NHS to adhere to Network and Information Systems Regulations (NISR) and Cyber Essentials.

(M) confirmation required

[redacted]

6.1.3 Audit trail

The system should provide an audit trail of all transactions, including:

- Facilities to enable the post-event identification of specified event (e.g. attempts to gain unauthorised access to information, failed logins) including times and user ID's involved and to produce reports accordingly

- A complete Audit trail of all edited values in all records including; user identifier, workstation identifier, date & time of change, original value and new value so that it is possible to derive the original and any intermediate state of any record and details of the changes as well as read access.

- A full audit trail of where samples have been (route history)

It should also be compatible with NHS national Fairwarning system

(M) confirmation required

[redacted]

6.1.4 Minimum basic operation

The DA must operate to the same basic level of operation as the existing DA: PukkaJ. This has been used as an image repository. DICOM-RT must be supported, in particular Search and Query tools to allow automated transfer of files.

(M) confirmation required

[redacted]

6.1.5 Minimum components and technical capabilities

All hardware, software and licenses required, remote access within the hospital network and outside the hospital network, user control and authorisation to be provided. It must have a high level of availability and resilience. The resilience of each component of the solution they are providing, i.e. Hardware, Software, Database, Interfaces etc. must be identified. Include a test system, where configuration changes and upgrades can be tested before clinical implementation; and provide a remote support capability. Remote access to the system for maintenance and problem resolution must be via NHS SWAN.

(M) confirmation required

[redacted]

6.1.6 Minimum compatibility

The offered product must be fully compatible with the Board's existing equipment (see Tables 1 to 4), including the network and IT security arrangements, The Contractor must be able to demonstrate such integration, at the request of the Board, by providing details of a reference site with the same equipment, or by a realistic demonstration of the equipment in use.

(M) confirmation required

[redacted]

6.1.7 Retention of Data

The offered product must include the conversion and transfer of the all the data stored in the Board's existing DA system's database into the new offered system.

(M) confirmation required

[redacted]

[redacted]

6.1.8 Continuity of Service

It is essential that the Board continues to provide a clinical service to its patients, even during the installation and implementation of the offered Products. The Contractor must explain how the offered Products will be installed and implemented without interruption of the Board's clinical service. A full and detailed plan for the installation and implementation of the offered Products must be presented and be acceptable to the Board.

(M) confirmation required

[redacted]

6.1.9 Technical information

Copies of full technical documentation must be provided for all components of the DA hardware, software and any third-party equipment, including operator's manuals, administrator's manuals and technical manuals describing the system configuration and operating procedures. All system documentation including that for subsequent software revisions must be in English and clearly labelled with the version number and release date. A detailed acceptance protocol covering both supplier and customer aspects must be provided.

(M) confirmation required

[redacted]

6.1.10 Additional fees

The offered Products should be free from any additional fees or software subscriptions that are required for the use of the Products. Furthermore, the Board should not be required to purchase a service contract in order to have full use of the offered Products.

(M) confirmation required

[redacted]

6.1.11 Minimum Requirements for Training

In order to comply with statutory requirements, it is essential that all necessary staff are trained in the use of the new DA (including system operation, commissioning, system administration / configuration, physics support, imaging, maintenance/repair, quality assurance and clinical implementation).

All training offered must be identified. Details must include which staff group the training is for and the period of time on site. There must be no additional costs for any core training provided off site. Optional training courses, whether on or off site, must be described and costs identified. Contractors must provide information on their recommendations for training of the various multi-disciplinary groups on the basis of discussions with Health Board representatives.

(M) confirmation required

[redacted]

6.1.12 Minimum Requirements for Equipment Warranty & Support Services

A warranty, commencing from the date of acceptance for the TPS will be provided. The period of the warranty will be twenty-four (24) calendar months from Acceptance. This warrants all modules, components and parts such that any failure during the period of the warranty would be replaced at no extra cost to the Health Board. During the warranty period, the Contractor will rectify faults, as detailed in the Agreement, within the timescales laid out in the Agreement. The Contractor's Engineer will attend on site, at no cost to the Health Board, if required to meet these conditions.

Remote access computer support must be provided to facilitate fault investigation and resolution and should be stated. Details should be provided of how these facilities are provided including confirmation of NHS network connectivity agreements.

Servers should be provided with a minimum 5-year manufacturer's warranty and clients with a minimum 3-year manufacturer's warranty unless other arrangements for support are offered.

Following expiry of the warranty period, the Health Board's staff or other third parties may undertake the service and repair of the TPS hardware. Any parts of the equipment, which must not be calibrated, serviced or repaired by Health Board staff or third parties must be stated.

(M) confirmation required

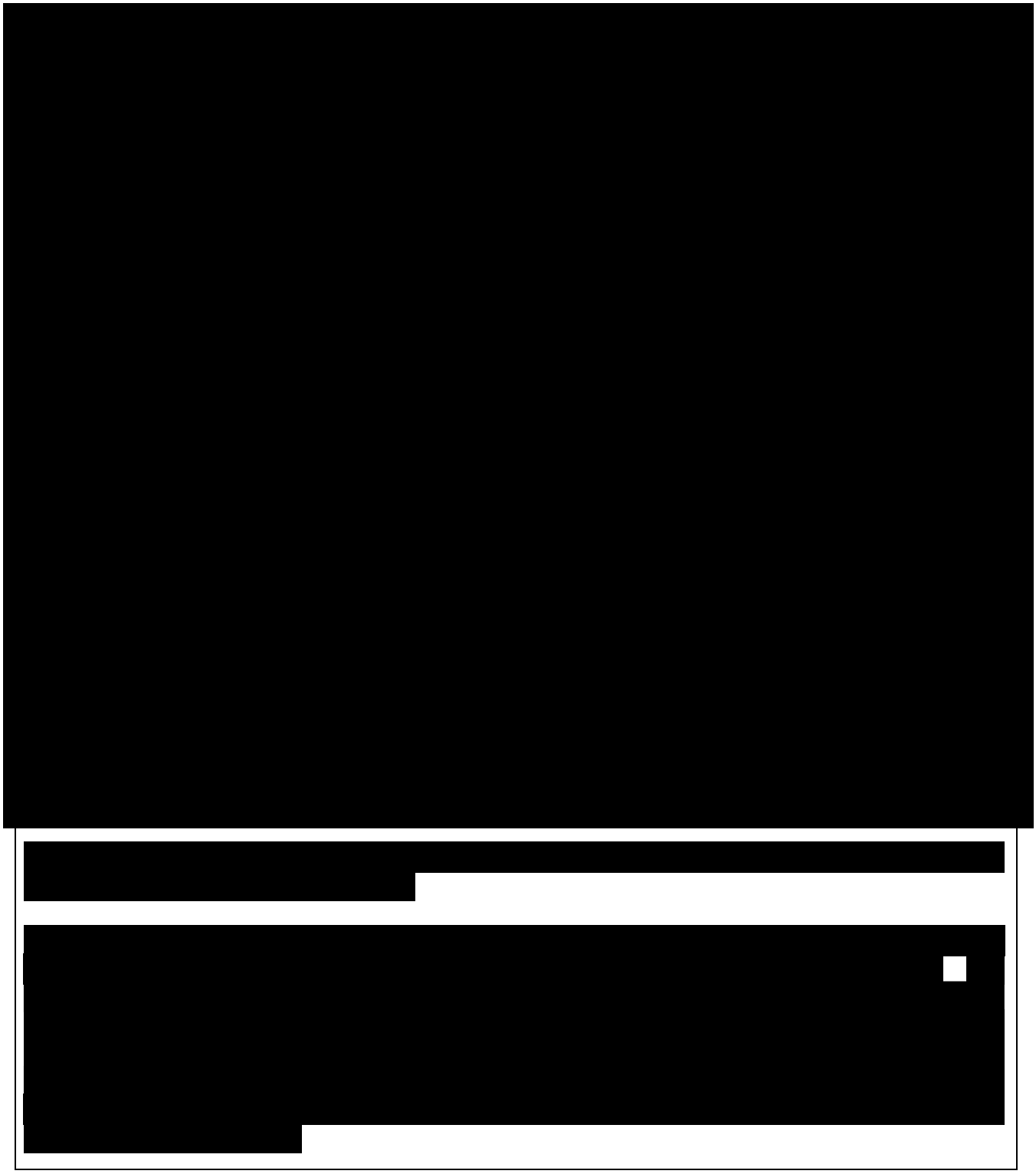
6.2 Evaluated items

6.2.1 Servers and network infrastructure

The offered Products must include the underlying IT infrastructure that enables full functionality. This includes the computer servers, network devices and supporting software that: store data and images; manage user logins and credentials (e.g. domain controllers); permit user access to the OMS software (e.g. via Citrix); provide backup functions; continuous power supply (e.g. UPS); etc. The ECC has existing structured cabling and any required changes or upgrades to the cabling should be included in the offered Products. However, bidders must confirm that they accept the principle of NHS Lothian, Fife and Borders procuring workstation and server hardware for the proposed system through existing NHS Scotland or alternative Government / Public Sector framework contracts.

(E) provide details

[redacted]



6.2.2 Third party software:

The offered Products must include all third-party software needed to realise the full functionality of the system. The Contractor should confirm acceptance of this requirement and explicitly state which, if any, of the Board's existing software licenses will be retained.

(E) provide details

[redacted]

6.2.3 Paperless working:

The Board aims to use paperless workflows more extensively. The Contractor should describe the functionality of the offered Products, as it relates to these requirements, as well as how, and to what extent, the offered Products meet this requirement.

(E) provide details

[redacted]

6.2.4 System configuration and management:

The design of the offered Products should permit authorised and trained Board staff to undertake maintenance tasks, fault-find, run diagnostic tests and modify a range of System settings and parameters. The Contractor should describe the features of the offered Products that permit such access. If granting access to these features requires that Board staff receive specialised training from the Contractor or a third party, then the Contractor should clearly state what training is required and include the training within the offered Products

(E) provide details

[redacted]

[redacted]

6.2.5 Compatibility with the Board's operating procedures:

The offered Products should be as compatible as possible with the Board's current operating procedures in order to ensure that the Board can continue to deliver the radiotherapy service in a safe, efficient and effective manner. Therefore, the Contractor should identify a radiotherapy centre where the offered Products are in use and can be viewed by the Board

(E) provide details

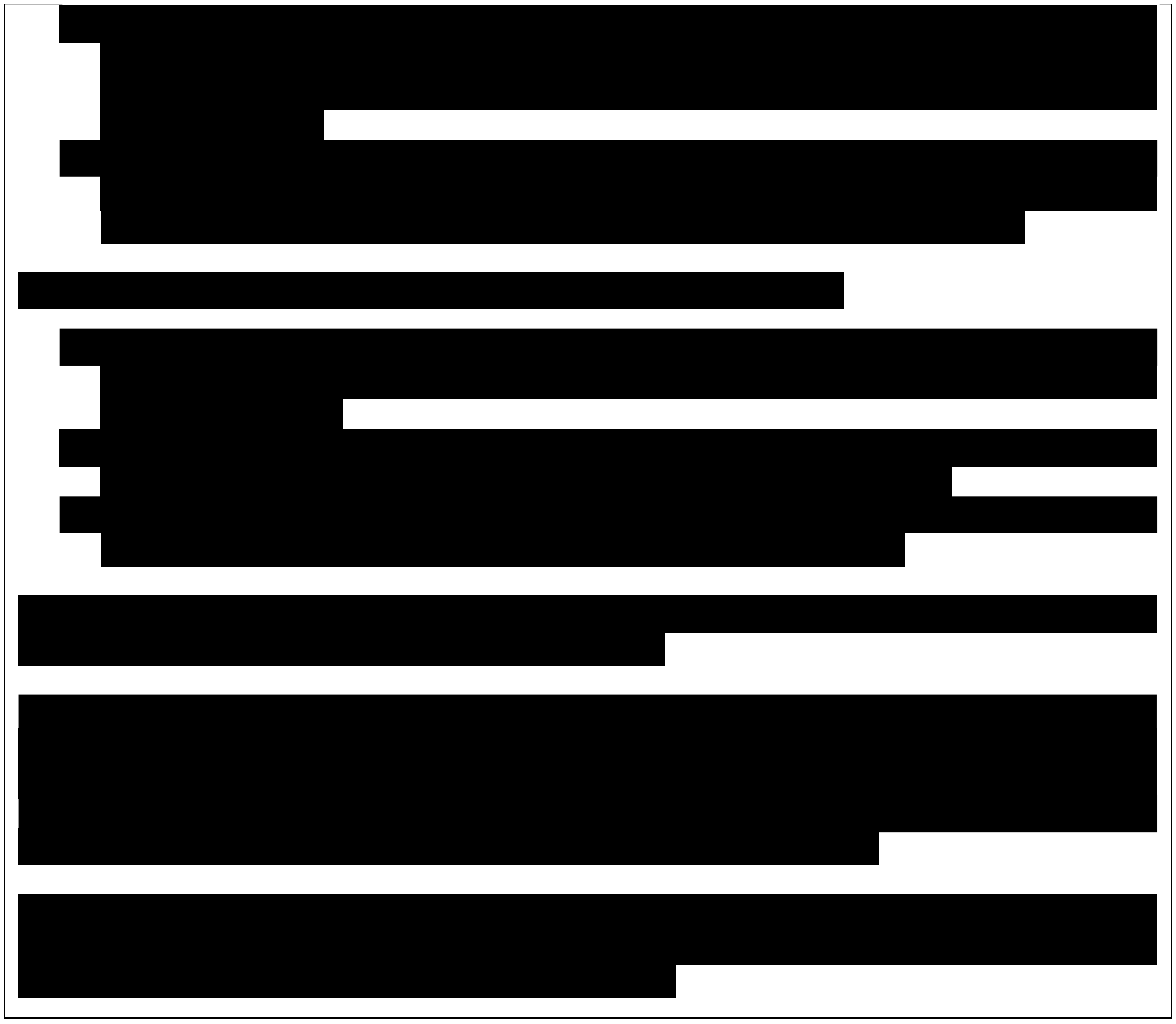
[redacted]

6.2.6 Network Configuration and IT Security:

In addition, the offered Products should allow the Board to control the access privileges of individual users and defined groups of users. The anti-virus software, Cisco AMP, is used across all Board computers and updates to operating systems are applied regularly, with the exception of computers classed as medical devices. The Contractor should explain whether, and how, anti-virus software can be installed on computers included with the offered Products and whether, and how, regular software updates can be applied (including operating system updates). If the Contractor requires a specific anti-virus software package different from the Cisco AMP software used by the Board, then the appropriate software and licenses should be included with the offered products. If the offered Products include computers that are classed as medical devices, these should be separated from the wider Board network by firewall(s) if the computers in question cannot receive updates or have anti-virus software installed. The Contractor should describe the measures taken to separate such computers from the rest of the network, including any firewalls, and more generally explain the features of the offered Products that minimise the risk from malware or external attack. We use Ivanti device and application control for managing USB connected devices

(E) provide details

[redacted]



6.2.7 Benefits, Risks & Consequences of Change

Radiotherapy treatment delivery is a complex, multi-stage process incorporating many inter-related stages of booking, simulation, planning and treatment and draws on multiple, specialised human and technical resources. The Health Board has an existing set of protocols and work processes that have been developed to deliver a safe service and the benefits, risks and consequences of implementing new equipment and software need to be assessed as part of this tender.

The Contractor must provide sufficient details to allow assessment of the consequences and/or risks of implementing their offered DA. Details to be provided include the compatibility with the existing knowledge base and skill set of staff in all of the areas within the radiotherapy department, and the estimated time to educate staff for new features and functionality, the overall length of training, and the clinical implications from the potential delay in implementing new features. The Contractor should indicate the expected benefits to be gained from introducing this functionality and feature set, particularly those areas identified above.

In addition, the Contractor should provide technical details of any arrangements to facilitate migration, or integration, of patient information stored within the department's existing DA into the new system.

Contractor Response	(E)
[redacted]	

6.2.8 Support contract

A fully comprehensive support contract which satisfies the following requirements should be offered to apply for a period of 3 years following expiry of the warranty.

The contract should provide for resolution of all software and hardware faults. A separate option should be provided for the additional provision of all major updates to software.

For systems with hardware installed locally at the ECC, the contract should provide for all spare parts coverage. If certain component parts are excluded from the proposed support contract, these must be specified.

Technical support and advice by telephone and will be available by telephone, free of additional charges, and without limitation, from 08:30 to 18:00, Monday to Friday, for the lifetime of the equipment. This excludes Christmas Day and New Year's Day.

Remote access computer support must be provided to facilitate fault investigation and resolution.
Details should be provided of how these facilities are provided including confirmation of relevant NHS network connectivity agreements.

Contractor Response.	(E)
[redacted]	

6.3 Information required

Bidders should provide detail of the network connectivity requirements for the proposed solution indicating: -

a. Number and type of connections required in each location
b. Connection speed/minimum bandwidth required for functionality over
    i. local area network
    ii. wide area / SWAN networks

(I) provide details
[redacted]

There should be a clear identification of what hardware is included in the tender submission and that which is optional. All optional items should be clearly identified. All hardware to be supplied as part of the tender should be clearly identified. Details of processors, graphics cards, memory and disk storage should be provided along with any network interfaces

(I) provide details
[redacted]

Details of the workstation monitors should be provided, including viewable screen dimensions & aspect ratios, colour depth and use of multiple screens.

(I) provide details

[redacted]

Details of the operating system(s) used by the DA should be provided (servers and clients). The computer operating system should be able to be supported for the lifetime of the DA, or upgraded as required. There should be a clear identification of what operating system & network access licences are included in the tender submission.

(I) provide details

[redacted]

Details of additional software expected / required to be installed on the servers / clients should be provided. It should be noted that the Health Board's current Anti-Virus /Anti-Malware solution is CISCO AMP and their Encryption solution is Bitlocker and Ivanti for USB devices.

(I) provide details

[redacted]

Details of DICOM compliance and any interfaces or drivers should be provided. Where appropriate, the format in which images and data are stored should be identified and described.

(I) provide details

[redacted]

Please describe any support which would be available to assist the Cancer Centre in installation, commissioning (including data acquisition) and customisation of the treatment planning and delivery systems.

(I) provide details

[redacted]

Any supporting equipment will be supplied by the Board beforehand.

(I) provide details

[redacted]

Prior to delivery of the equipment, the Health Board must be supplied with a complete list of all items to be delivered with information on package sizes and weights.

(I) provide details

[redacted]

Pre-installation site examinations, delivery and installation of the equipment shall be free of any additional expense to the Health Board. The Contractor must provide any special transport, lifting or handling equipment

(I) provide details

[redacted]

Dates for delivery of the equipment and dates and duration of the installation will be agreed by the Health Board with the Contractor and confirmed in writing. In each case the equipment must be delivered or installed within 6 weeks of the agreed date. Written notification must be given of any equipment that will be delivered at a later date than that for the main system.

(I) provide details

[redacted]

If the offered Products require any consumable supplies, such as backup tapes, then the Contractor should explicitly and clearly list such consumables. The description should include an estimated quantity of the consumable required per unit time (e.g. per annum).

(I) provide details

[redacted]

The Contractor should identify any components of the offered Products that are likely to require replacement at intervals over the lifetime of the offered Products (the Board considers the lifetime of the DA to be 5 years from the date of acceptance).

(I) provide details [redacted]

If the Contractor has any planned developments or major changes to the offered Products that it intends to release during the Warranty Period of the offered Products, then the Contractor should describe these planned developments along with any implications for the use of the offered Products by the Board, taking account of the local radiotherapy service as described in Section **Error! Reference source not found.**. The Board wishes to provide as modern a service as possible. If the Contractor feels that any impending product release may be of interest to the Board, then it should briefly describe the impending additional product and offer it as an optional extra, along with the offered Products.

(I) provide details [redacted]